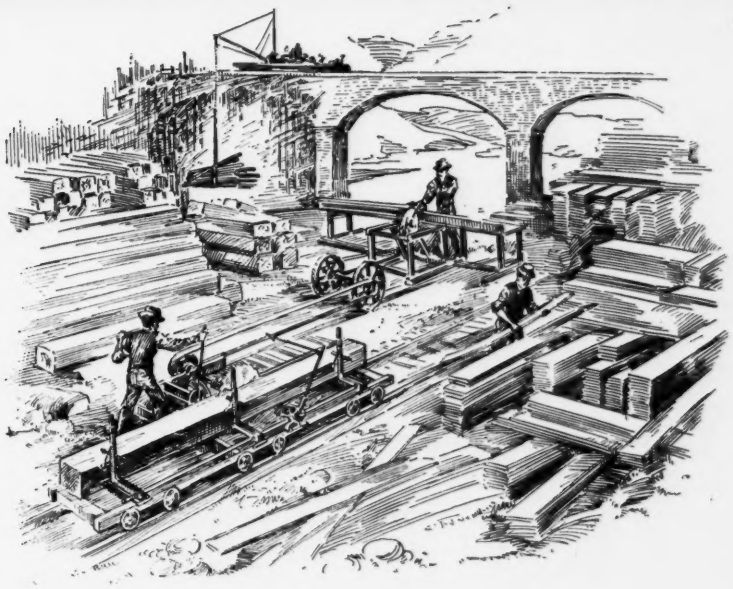
BRIDGE AND BUILDING CONVENTION NUMBER

Railway Maintenance Engineer

ne 12 CHICAGO: Transportation Building NEW YORK: Woolworth Building NOVEMBER, 1916 CLEVELAND: Citizens' Building WASHINGTON: Home Life Building Number 1

The Portable Railway Saw Mill Plant



A Portable Saw-mill Plant—composed of a saw-mill, a cut-off saw, and power of some kind—really gives a railroad a movable lumber yard, to be transported anywhere on the system that it can be used.

Where a Wooden Bridge is to be Replaced with one of concrete—take the saw-mill plant there and re-saw the old bridge timbers into lumber for the concrete forms.

Where an Old Dock is Being Dismantled, take the saw-mill outfit there and saw the timbers into usable sizes, to be stocked at some convenient point ready for use along the line.

If the Road Owns Timber Land, take the saw-mill plant there and cut the logs into lumber, ready for use when needed.

It is usually cheaper to take the saw-mill equipment to the job than to ship the timbers to some permanently located plant.

An "American" outfit capable of turning out 3,000 to 5,000 feet of good lumber per day can be operated at a cost of $8 to $10 a day.

The lumber it makes is easily worth $75 to $125. That makes the lumber come pretty cheap, doesn't it?

If you have power, $500 will buy an outfit big enough for ordinary railway work. And even with power included, the cost will hardly exceed $1,000.

Probably a plant of this kind could be kept busy the year 'round, somewhere on the road—and it would pay for itself in a month.

After that, lumber will cost you what you pay for power for your mill, plus the wages of two or three men.

Let us go into this matter with you thoroughly. We can show you how an "American" saw-mill outfit will realize big economies for you.

We also make a PORTABLE VARIETY WOODWORKER for concrete work. Send for illustrated circular

American Saw Mill Machinery Co.

1366 HUDSON TERMINAL, NEW YORK

The CINCINNATI FROG & SWITCH COMPANY

MANUFACTURERS OF
TRACK EQUIPMENT
FOR STEAM AND ELECTRIC RAILROADS
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Frogs *Switches* *Crossings* *Stands*

3

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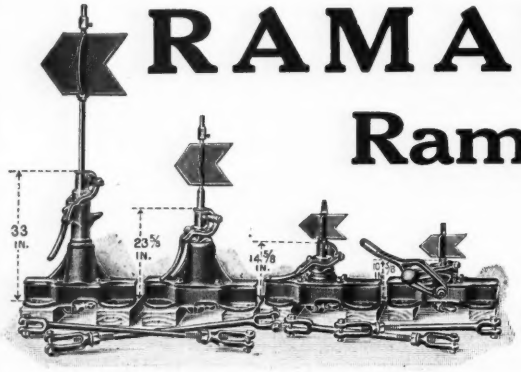

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for many a vexatious problem in fire, sprinkler and other water distribution systems and a positive cure for all needless water waste down the overflow of Tanks, Standpipes and Reservoirs. Absolute dependability is the strongest feature of

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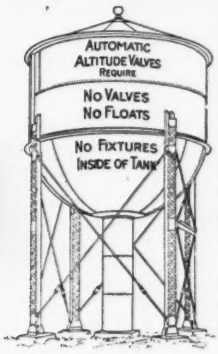

They automatically maintain the water level constant at the desired point without the use of uncertain and cumbersome floats or fixtures of any kind within or outside of the tanks.

No freezing in cold climates. No water-hammer or shock. Thoroughly cushioned. Virtually indestructible. They close automatically when the head of water to the height is desired and open automatically when it drops below this mark.

May also be arranged to close by electricity from any distant point and to automatically close when a break occurs in the mains. When necessary they may be so connected as to "work both ways" on a single line of pipe.

Valves Cushioned at all times by air and water
No water hammer or bursting mains
"NO METAL-TO-METAL SEATS"
Economic Sensitive Reliable
Virtually Indestructible

"Hosts" of "References"

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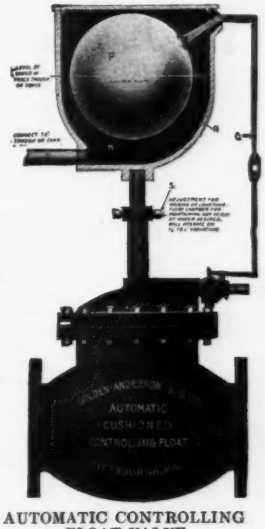
Angle or Globe up to 24 in.

These valves control the water level in tanks, standpipes and reservoirs. For high and low pressure. The float swivels to any angle desired. Made both angle and straightway. Instantly adjusted to operate quickly or slowly. Users say "their equal is not made." No metal-to-metal seats

Golden-Anderson Automatic Cushioned Controlling Float Valves

These Automatic Cushioned Controlling Float Valves are especially adapted for water-works, gate chambers, heaters, tanks, and similar service. Cushioned at all times by air and water. Operate on ½ to ¾ inch variation.

"No metal-to-metal seats."



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Golden-Anderson Automatic Cushioned Water Pressure Regulating Valves

for high or low pressure service are a *necessity* for modern water-works and railroads.

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Will maintain a constant pressure regardless of the volume of the initial flow.

When fitted with electric attachment, valve can be instantly opened to full area from any number of distant points, thus insuring full pressure in case of fire, etc.

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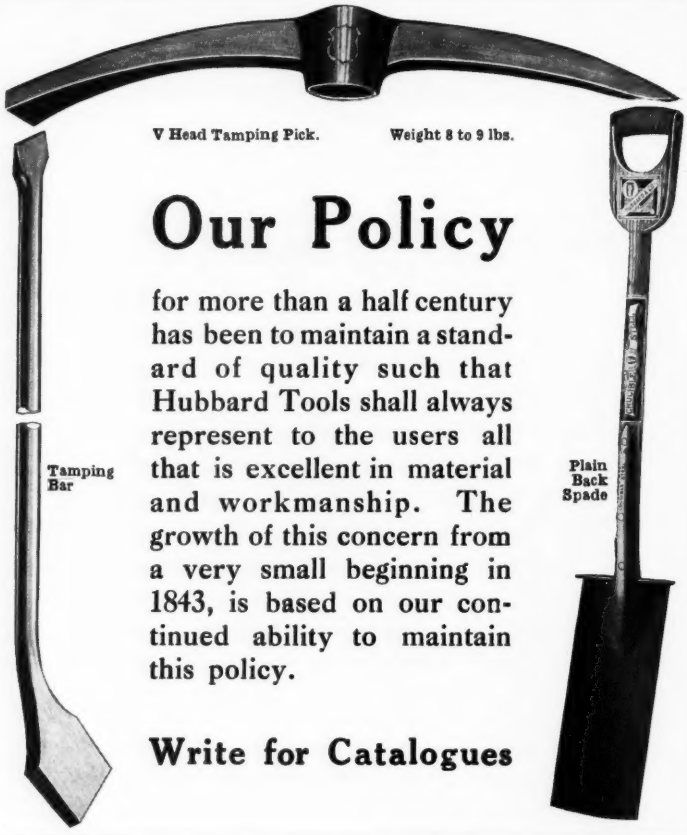
HUBBARD & CO.
Pittsburgh, Penna.



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for more than a half century has been to maintain a standard of quality such that Hubbard Tools shall always represent to the users all that is excellent in material and workmanship. The growth of this concern from a very small beginning in 1843, is based on our continued ability to maintain this policy.

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Manufacturers of

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Tell us what your blasting work is and let our expert field men suggest economic and practical methods.

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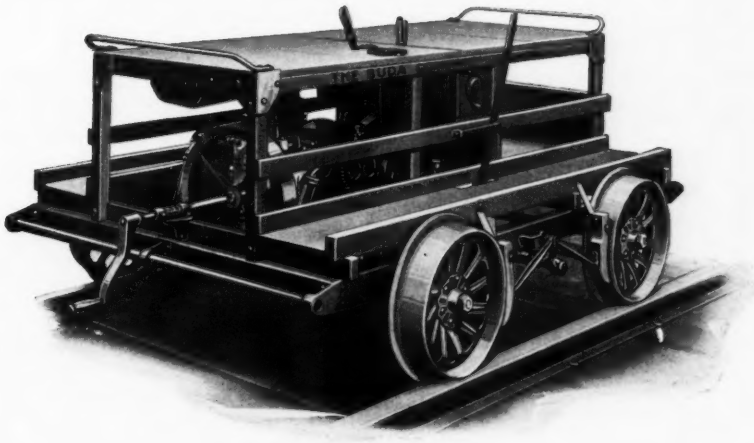

For Bridge and Building Department

$1,914.00 SAVED

THE following is an abstract of a paper presented by J. L. Walsh, Superintendent, Missouri, Kansas & Texas Ry., at an operating department staff meeting held at Galveston, Texas, on June 22 and 23, 1914:

"While the motor car promotes efficiency and economy in track work, probably a greater efficiency and economy obtains from their use by bridge gangs. We had in use by a bridge gang a Buda motor car No. 19 equipped with a free running engine, which gave perfect satisfaction. We found that it was possible to eliminate four moves of the bridge outfit per month, the average move being about 25 miles. As the outfit consisted of six cars, or about 150 tons, and as the transportation expense of handling freight on this district is 0.027 cents per ton mile, we were able to save on this item alone $486.00 per year. A further saving of 20 hours each month to trains handling bridge material will amount to $65.00 per month, or $780.00 per year. With the aid of a motor car in a bridge gang, we can operate with one man less, making a saving in wages of $648.00 per year, or a grand total of $1,914.00 per year. With the aid of a push car we can handle four 30-ft. stringers, together with the men and tools. A great deal of money was also saved by distributing gang over 20 or 25 miles doing small jobs that would be very expensive if handled in the old way."

The Buda No. 19 is designed to take care of railroad track conditions where extreme heavy grades are encountered, and with its powerful free running engine, embodies a wider range of service than any other type.

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Railway Exchange Building, Chicago

ST. LOUIS
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C. F. MASSEY COMPANY

NEW YORK CHICAGO SPOKANE

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Our factories are located as follows:

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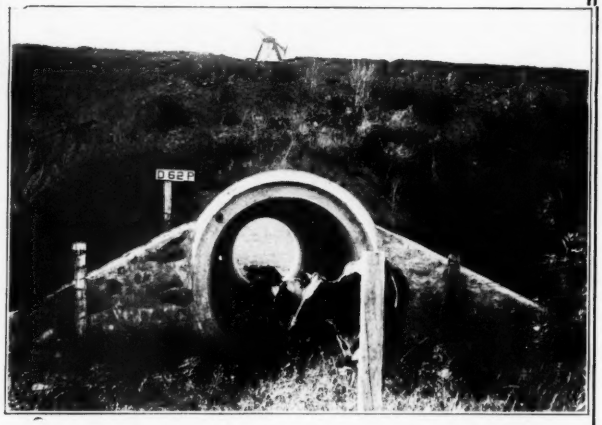
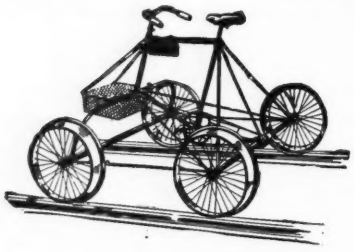
Chicago, Ill.	Anna, Ill.
Minneapolis, Minn.	Memphis, Tenn.





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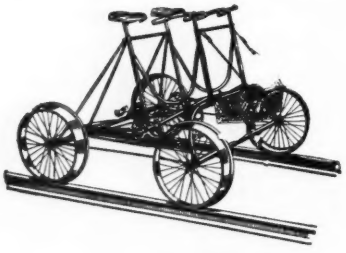
are our specialty. We make them to fulfill any and all requirements and our success is attested by the repeat orders from roads that have given them a trial. Our new catalog contains full information and will be sent to you on request.



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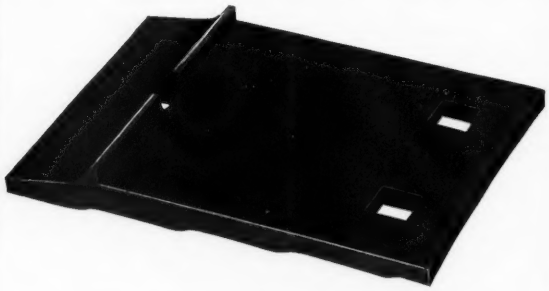

More than a mere Tie Plate—A safety device—An economic device—A device promoting easy riding Track. The

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will more than pay for itself in saving of Rail and Wheel wear and in reduction of maintenance expense, as well as performing the usual functions of a Tie Plate.

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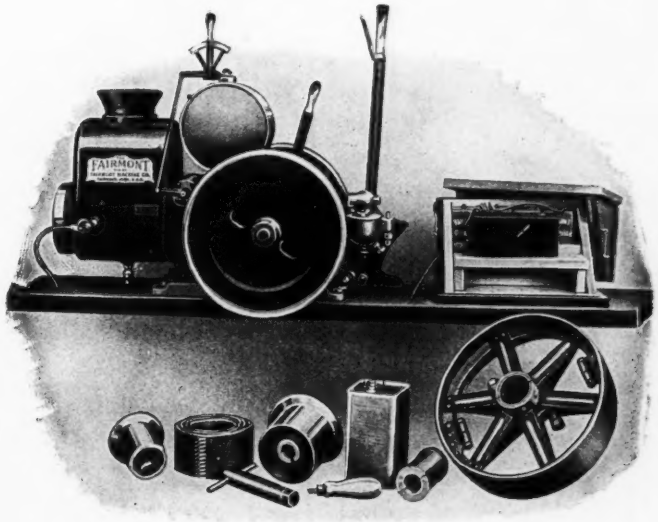

Fairmont Engine for Converting Hand Car Truck into Motor Car
4 H. P. 220 lbs. 6 H. P. 350 lbs. 8 H. P. 540 lbs.

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Help your foremen shorten the long, tiresome inspection trips this Winter over their sections. Tell them about the

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FAIRMONT ENGINES stand the severe cold of Winter better than any other make BECAUSE

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3. The water-jackets on all FAIRMONT engines (4 H. P.) are guaranteed not to freeze, if kept only two-thirds full of water.

Write for catalogue on engines and motor cars.
Quantity prices to companies. Easy terms to Railroad Men.

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MAIN LINE SWITCHES

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THE ANDERSON INTERLOCKING SWITCH STAND

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The Anderson Interlocking Switch Stand is of the Rotary Skeleton Type, its principal feature being the Anderson Interlocking Mechanism which forms a double-locked connection between the switch and switch stand.

WHAT IT DOES

1. With the Anderson Interlocking Switch Stand it is impossible to apply the padlock **unless the switch is positively closed and interlocked.**

2. It prevents the display of a "clear" or safe signal **unless the switch is positively closed and interlocked.**

3. It will not allow the switch to open under traffic when properly closed and interlocked **should an accident destroy, overturn or disconnect the switch stand.**

4. Its simple, correct design and massive construction insure positive action and long life.

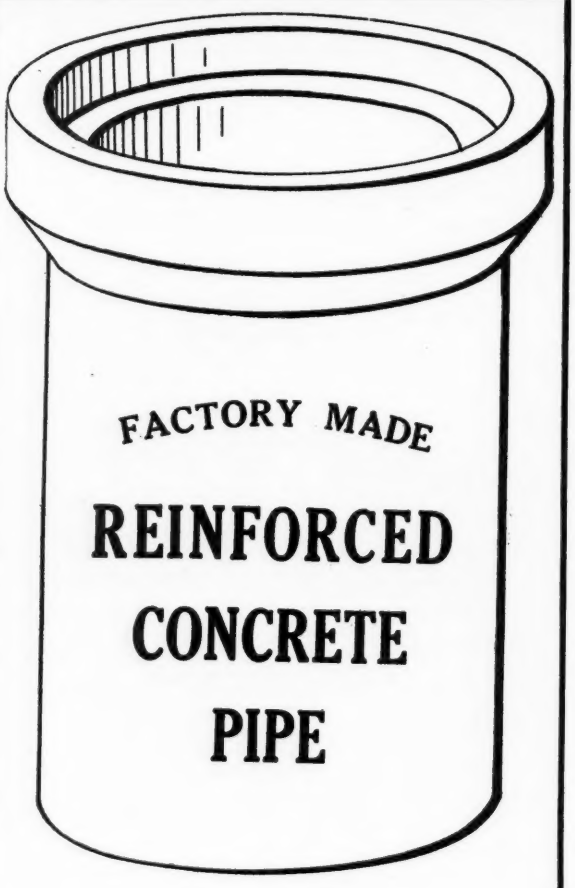
WHY IT DOES ALL THESE THINGS

is quickly evident on an examination or test of the Anderson Interlocking Switch Stand itself.

Send for complete descriptive booklet and information about tests, etc.—Do It Today.

Manufactured exclusively by

The American Valve & Meter Co.
Cincinnati, U. S. A.



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Round Pipe
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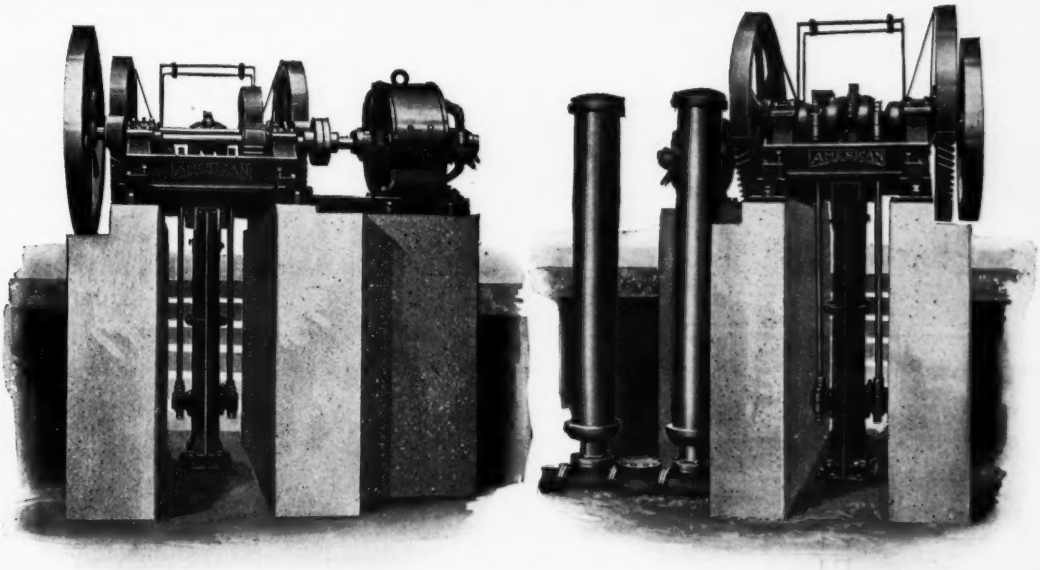

A Deep Well Power Head Designed for Two-Stroke Heavy Duty

One of the most popular methods of pumping large quantities of water from deep bored wells with plunger pumps is by the use of two-stroke water cylinder. This cylinder requires for its operation a two-stroke working head.

To provide a design for this purpose in which there is a low center of gravity and thus eliminate a large part of the vibration of a power head of high frame construction, we have produced the working head shown in the accompanying illustrations.

The main frame of this power head which carries the crank shaft, gears and counter-shaft is of exceptionally low design and is mounted on two parallel bed plates which are securely bolted to the concrete foundation piers.

The crank shaft is constructed similar to that of a heavy-duty triplex pump and transmits reciprocating motion to the plunger rods through crossheads and connecting rods, one connecting rod being used for the inside plunger rod and two for the outside rod.

The center line of crankshaft is offset from the center line of plungers to insure a more direct vertical pull on plunger rods while water is being lifted, thereby reducing wear and friction between crossheads and guides.

To remove rods, tee-head and piping from the well, the main frame is slid back on the cast guide frames until it clears the well.

The main gears and pinions have helical cut teeth of heavy construction to insure highest efficiency and quiet running.

This power head is usually installed with the main frame near the floor level and a stairway leading into the pit for access to the crossheads, making it exceptionally convenient for attendance.

Combined with an "American" all bronze, two-stroke water cylinder, this working head forms a pumping unit of high efficiency and great reliability.

"American" deep well plunger pumps are described in catalog 130. It will be mailed to you for the asking.

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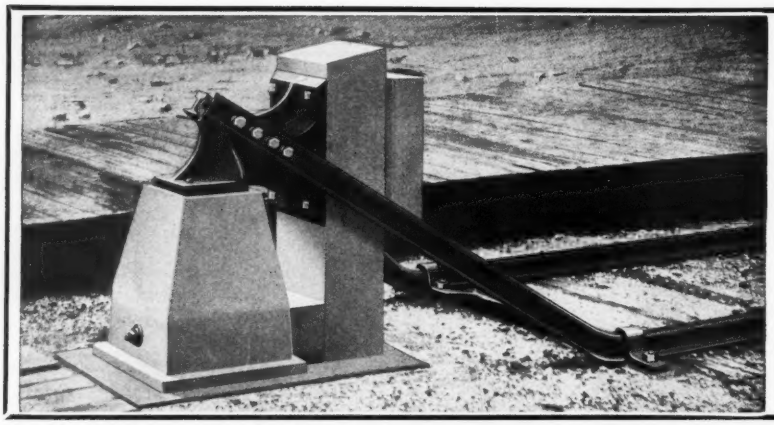

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Simple, Strong and Lasting
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Rife Hydraulic Ram

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Its reliability under all conditions of service is being convincingly demonstrated every day both in this and foreign countries.

Write for our booklet which tells how the Rife Ram will eliminate your pumping charges.

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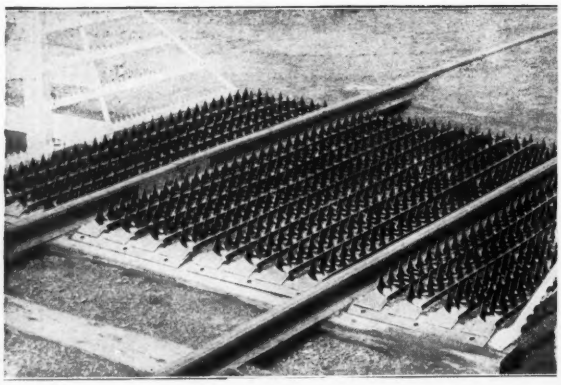

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National Steel Cattle Guard

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Write for our new illustrated circular describing the 1917 "National"—Read why the "National" is being used by leading railroads. Write TODAY.

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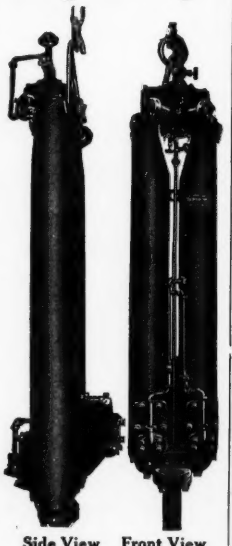
Simplifying simplicity is always difficult, yet that is what has been accomplished to a marked degree in the operation of

EMERSON
Steam Pumps



Side View Front View

So extensively used on railroad construction work by contractors and the railways because of their simplicity, reliability and economy.

Simplified Simplicity
Emphasized Economy
Added Adaptability
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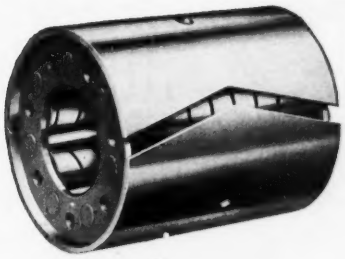
Such the advantages secured by means of the new form of steam valve on the EMERSON. Balanced against steam pressure, practically eliminating friction, entirely eliminating lubrication and seven wearing parts. Such the features which make good practice yesterday better practice today, i. e., using Emerson Pumps.

Catalog No. 12, the "Story of Simplified Simplicity," is ready. Pumps in stock and ready for immediate shipment.

The Emerson Pump & Valve Company
ALEXANDRIA, VA.



$35.00 A MINUTE

THIS is the amount that the Chicago Northwestern Railroad spends every minute of a working day for the maintenance of its track and bridges. Every day it costs them $21,000. Other roads are spending as much or more.

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Hyatt Roller Bearings on a gasoline car will save 30% of the gasoline that is required to propel a plain-bearing car. To the average railroad this means a saving of $21,000 per year.

The next time you order a new push, hand or gasoline car, specify Hyatt Roller Bearings.

The car manufacturers can furnish you with interchangeable boxes with Hyatt Bearings for use on your old cars.

Road masters and bridge supervisors should have our new Bulletin No. 1100. It contains information about the construction of the bearing, its durability, the cost, and how it is installed. Send for it to-day.

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Write it in your Specifications

For

Rails and Fastenings
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Ties Treated and Untreated
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TO serve our clients most competently we maintain expert metallurgists, engineers and chemists at important manufacturing centers in this country and abroad, and experienced inspectors at principal manufacturing plants.

Our service is to *assure* by courteous cooperation with manufacturer, dealer or selling agent a strict compliance with the specifications and by stimulating delivery, a reduction of expensive delays.

Write for booklet describing our service for your Maintenance of Way Department.

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Railway Maintenance Engineer

Volume 12 November, 1916 Number 11

(With which is incorporated the Engineering and Maintenance of Way Edition of the *Railway Age Gazette* and *Railway Engineering and Maintenance of Way.*)

Published on the last Thursday preceding the date of issue by the
SIMMONS-BOARDMAN PUBLISHING CO.,
TRANSPORTATION BUILDING, CHICAGO, ILL.

NEW YORK: WOOLWORTH BLDG. CLEVELAND: CITIZENS' BLDG.
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Entered at the Post Office at Chicago, Ill., as mail matter of the second class.

Subscription price, including the twelve regular monthly issues of the *Railway Maintenance Engineer* and the four daily issues of the *Railway Age Gazette*, published in connection with the annual convention of the American Railway Engineering Association: United States, Canada and Mexico, $1.00; foreign countries (excepting daily editions), $2.00.

WE GUARANTEE that of this issue 6,938 copies were printed; that of these 6,938 copies, 5,805 were mailed to regular paid subscribers, 83 were mailed to advertisers, exchanges and correspondents, and 1,050 were provided for new subscribers, copies lost in the mails and office use.

The *Railway Maintenance Engineer* has applied for membership in the Audit Bureau of Circulations.

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Opening a Washington Office

The National capital has become in recent years an increasingly important source of news relating to every phase of the railway industry. The desirability of permanent editorial representation in Washington has been felt for some time by the Simmons-Boardman Publishing Company, which, in addition to the *Railway Maintenance Engineer*, publishes the Railway Age Gazette, the Railway Mechanical Engineer, the Railway Signal Engineer, and the Railway Electrical Engineer. It is only recently, however, that the opening of such an office has been financially possible through the broadening of this company's activities, and still more recently that the move could be consummated, as it was first necessary to find the proper man and relieve him of other duties. An editorial office for all these publications has now been opened in Rooms 64 and 65, Home Life building, Washington, D. C. It is in charge of Harold F. Lane, who has had a long and valuable experience in railway newspaper work, and in addition to a thorough knowledge of railway economic matters has a good working knowledge of the more technical departments of the railway business.

Closing the Season's Work

The season now drawing to a close has been an unusual one in many ways from the standpoint of the maintenance of way department. For the first time in several years the earnings have been sufficiently large to warrant the authorization of many deferred improvements. Early in the spring, however, when plans were being made to take advantage of this condition, it became evident, that, in spite of the fact that the money was available, even less than a normal amount of work could be completed because of a shortage of labor and delay in the delivery of materials. As a result the general condition of the track is probably no better now than at the same time a year ago, while in some localities it has deteriorated because of the shortage of labor. This places an added responsibility upon those in charge of its maintenance. Within a few weeks frost will prevent further extensive surfacing and similar work. It is, therefore, absolutely essential that every effort be made during the short time remaining to place the track in the best possible condition for the heavy traffic which now appears to be in prospect for the winter. Hours spent in placing the track in perfect condition before it freezes will save days in maintaining it during the winter. Incidentally, the lesson of this year points to the importance of beginning now to prepare for next season's work in order that it may be possible to undertake it actively as soon as the frost leaves the ground in the spring.

Station Building Construction

The necessity for keeping small passenger stations in a sanitary and presentable condition emphasizes the importance of substantial construction. Too many station buildings have been built that look shabby within a few months of their completion, and in five years look older and offer more justification for criticism on the part of the public than other station buildings four times as old. Permanent construction cannot be justified in many classes of railway structures because they will frequently outlast their

usefulness, changing conditions making them obsolete or ill-adapted to their intended purpose before their physical conditions are such as to require their replacement. This is true of the passenger stations of our large cities. Because of the rapid growth in population they generally become inadequate and by reason of the rapid advancement in methods and facilities for handling traffic, they become obsolete before their normal life has expired. However, this argument in general does not apply to the passenger stations in smaller towns. Census statistics show that the smaller cities and towns, particularly in the agricultural regions of the east and middle west, are increasing but very little if at all in population, and, barring changes of line which require the moving of the station building to a new site, there is no reason why a well-designed, properly-built structure should not serve a small community indefinitely. To fulfill this requirement it must be designed and built to last. The design must be one that will wear well in the eyes of the traveling public. The fantastic designs grow tiresome, while one following the dignified lines will look as well at the end of 30 years as when it is built. From the standpoint of wear the requirements of the passenger station are unusually severe, and construction details that are entirely proper in a dwelling, for instance, will not serve the purpose in a building which must bear up under the careless usage of the public. A little more money spent for better or more serviceable materials will frequently add greatly to the life of the building and delay the time when the numerous evidences of wear and hard usage will give it the shabby appearance which is so largely responsible for the demands of the townspeople for a new building long before the station has really outlived its usefulness as a railway structure.

REORGANIZING THE GANGS

THE gang is the unit of the maintenance of way organization. While it may vary in size from a foreman and three or four men for a section or a small bridge gang to 75 or more men for a rail-relaying gang, the output of work is equally dependent upon the manner in which the gang is organized. It is commonly acknowledged that the personnel of the gangs has changed very rapidly in recent years. It has not been so generally realized that changed conditions frequently require the revision of methods and that it is possible that the present difficulties in retaining experienced employees in the service may arise from the continued application of the methods of a generation ago, which are perhaps antiquated and unsuited to the conditions of to-day.

Not many years ago wages in the maintenance of way department were fairly comparable with those in other industries with which the roads compete for men and an ample supply of efficient native labor was available. As the wages paid in these other industries have risen in recent years, those received by the men in the maintenance of way department have lagged behind, with the result that to-day many of the more capable men have gone into the other industries which have offered greater wages and the railways have been forced to go to the labor agencies and to take from them any labor which they might secure. At the same time the old practice has prevailed of paying all the men in a gang a uniform rate, with the result that these low wages have filled the gangs entirely with those of an inferior grade and have left the roads with few men that may be classed as potential foremen. With such a condition at the present time, the problem will become worse as the ranks of the efficient foremen are depleted.

Only in a relatively few instances has the possibility of the reorganization of the maintenance of way gangs been considered as a means of solving this problem. At the present time it is probably impracticable to raise the wages of all of the laborers to a point sufficiently high to attract a sufficient number from other industries to fill the gangs with men of the desired grade. It is not so impracticable to place a few skilled workmen in each gang paying them a wage sufficient to hold them and then to fill out the remainder of the gang with laborers, or helpers, as they are commonly termed in other trades where similar methods are in vogue. Such a method, if carefully worked out, need not increase the total expenditure materially and in many cases not at all. At the same time it will provide a nucleus of experienced men in each gang who will set the pace for the rest and thereby tend to increase the output of the entire gang. It will also provide a supply of material from which foremen can be created as the demand arises, while the abolition of the uniform rate will provide an incentive for the more ambitious and capable men to prepare themselves for promotion to positions as skilled laborers as vacancies in these ranks occur.

One of the greatest handicaps in the employment of labor in the track department to-day is the fact that one man is considered as good as another and there is no opportunity to differentiate between those of different ability and habits of work. As the wage rate is largely based upon the performance of the least efficient the only opportunity for an ambitious man to better his condition is to go into other work, for the promotion from the position of laborer to that of foreman is slow.

It is true that a plan of this general character has been tried to a limited extent on a few roads by the creation of the position of track apprentice, but it has not received the attention in any comprehensive manner that its success in other industries would appear to justify. It is frequently the case that a higher wage rate results in a decreased unit cost owing to the greater efficiency secured from the men. If the raising of the wages of one or two men in each gang to the point where skilled laborers can be secured and retained in the service after they have become experiencd and the ultimate cost of performing the work is thereby reduced the railroad as well as the men are gainers. The difficulty in recent years has been that railway managements have been prone to scrutinize wage rates so closely that they have lost sight of the ultimate cost of the work, when, as a matter of fact, the wage rate is secondary so long as the cost of performing the work is reasonable.

MAINTENANCE EXPENDITURES

ONE of the most difficult and at the same time one of the most important problems with which an officer in general charge of maintenance of way work is confronted is the determination of the proper standards of maintenance to be followed and the expenditures to be authorized for various lines of different traffic densities and earnings. As a basis from which to start, each line should be expected to contribute its proportion to the net earnings of the system, and money should not be spent on one line which must be derived from the earnings of another. This rule is, of course, subject to many important modifications. For instance, the expenditures for maintenance do not increase in direct proportion to the traffic, and there is a wider margin between gross and net earnings on lines of heavy business than on branch lines with only a few trains. Also, on lines of very light traffic, expenditures for maintenance cannot be reduced below the point where the safety of operation is endangered, although the business does not

justify even this expenditure. Again, frequently a road will feel warranted in maintaining a branch line to higher standards than the immediate business will justify in order to preserve relatively high standards over a system. However, these and similar deviations are made purposely and with a full knowledge of conditions.

Of greater consequence are the expenditures made because of a lack of a definite determination of the justifiable amount which may be spent. It is seldom that a roadmaster or a superintendent is criticized by the higher officers because his track is too good. On the other hand, when criticizing track which is not in the best condition, few men consider the amount of money which has been spent, the fact that the track may be as good as the traffic justifies or that excellent results may have been secured for the actual money expended. As a result, the local officers usually spend all the money they can secure on their respective lines, and endeavor to bring them up to the best possible condition without reference to earnings. Their only curb is the supervision given by the higher officers, and, instead of working with their superiors to ascertain the amount the road is justified in expending on the different minor lines and then limiting the expenditures to this amount, the local men enter into a contest with their superiors to persuade them to authorize as large an appropriation as possible.

This condition is responsible for the spending of much money, which is not justified by sound business principles. The inherent defect and the principal cause for this condition is the failure to consider the amount of money spent when praising or condemning the condition of a line. When a roadmaster receives more praise for work well done in maintaining a branch line with an expenditure of $800 per mile if this is all that is justified, than if he had expended $1,000 per mile and was maintaining track better than conditions warranted, this problem will be largely solved. It is easy to recognize good track and difficult to detect full value received from definite expenditures. This difficulty should not prevent a road from endeavoring to correct extravagance wherever it is found to exist. Such correction of extravagance is only one step in the promotion of a uniform, rational distribution of expenditures based on the needs of the property.

THE STEEL MARKET

THE present war in Europe defies comparison with any other conflict in the world's history. With millions of men withdrawn from productive employment in order that they may give their entire energies to the organized and wholesale destruction of life and property, and with neutral nations enjoying the unnatural prosperity engendered by the manufacture and sale of war materials, it is obvious that markets throughout the world must be in an abnormal condition. The steel industry, because of its close association to modern warfare, is affected relatively more than other commercial undertakings, although what is true regarding the price of high speed steel drills is essentially true also of the price of potatoes. The difference is one of degree only.

The prices of steel products at the beginning of this year bore such a sharp contrast to those of the depression of the winter of 1914 and 1915 that those who were compelled to buy these commodities could not bring themselves to believe that such prices could be maintained for any length of time. The representatives of the steel industry, on the other hand, predicted even higher prices, and the passing months have shown them to be the true prophets. While prices in general have not experienced any repetition of the rapid advances of the previous year, the steel market during 1916 has been characterized by marked stability, accompanied by small but steady increases. Structural shapes advanced between March, 1915, and March, 1916, from $1.15 per 100 lb. to $2.25. The price at present is in the neighborhood of $2.75. Track spikes, which were worth $1.35 in March, 1915, and had advanced to $2.50 in March, 1916, are now worth from $2.65 to $2.90. Similarly, carbon steel track bolts advanced from $1.85 to $2.50, and are now quoted at $3.25 to $3.50.

The steel mills are enjoying what seems to be an unlimited supply of new orders, and there is apparently no hope of any immediate improvement in deliveries. The unfilled orders of the United States Steel Corporation aggregated 9,522,584 tons at the end of September. This is a decrease of 137,775 tons from the corresponding figure at the close of August and less by 347,750 tons than the maximum on May 31, 1916, but a more definite comparison is obtained by recalling that the unfilled orders of the corporation in November, 1914, totaled only 3,324,592 tons.

This demand for steel comes from various sources. Besides the orders from the allies for strictly war materials, there have been calls for steel to be used in shipbuilding and for building and equipping railways. Shipbuilding has created a demand for plates, which, together with the car orders, explains the difference between the price of plates and that of shapes. A factor recently introduced is the naval program of the United States Government, including four battleships and a large number of smaller crafts. The requirements of the government alone for the next twelve months are estimated at from 250,000 to 275,000 tons.

In anticipation of the difficulties of delivery, most of the railways of this country have arranged for their rail requirements much farther in advance than is the usual custom. Those roads which failed to take this precaution are now in serious difficulty. One road which recently found it necessary to place an additional order for 25,000 tons was required to accept Bessemer rails in order to obtain delivery in the second half of 1917. The Canadian rail mills, which, under the Underwood tariff, gave the American roads an alternative market, have been of no avail in later months and only recently the Canadian government announced the preparation of plans for the assistance of the Canadian railways in overcoming the existing rail shortage consequent to the diversion of Canadian mills to war manufactures.

The status of the structural steel fabricator has not changed materially in the last six months, except in so far as the intervening time has served to use up the stocks that had been purchased on speculation early in 1915. The fabricating shops are not sharing in the prosperity of the war industry. The high prices have served to restrict structural steel projects, both as to steel frame buildings and bridges. As a result the shops are not working to capacity, although they have about as much to do as labor conditions and deliveries will permit. Orders at the present time, as shown by the statistics of the Bridge Builders and Structural Society, represent about two-thirds of the shop capacity.

On the whole, the situation presents a discouraging aspect to the railways which desire to show a reasonable return on any project involving the use of iron and steel in any quantity. However, the situation may as well be faced squarely, for, barring any sudden change in the policy of the warring nations in the near future, there seems little hope for any chance for any immediate improvement in the market from the standpoint of the purchaser.

LETTERS TO THE EDITOR

TRAINING FOREMEN

DANVILLE, KY.

TO THE EDITOR:

We hear a great deal about the section foreman problem, but the discussion seems to concern itself chiefly with the obtaining of new foremen, and little attention seems to be given to the conservation and raising to the highest state of efficiency of the existing organization. The retention of the men now in the service, the raising of their efficiency and the increasing of their ability, is a matter of supervision and the problem falls squarely on the track supervisor or roadmaster. Supervision of track does not consist merely of riding over one's district, looking for bad places in the track, detecting the foreman who is not handling his work properly, and reprimanding him more or less severely. This method may have been satisfactory when the demands on track were not so exacting, and when men were plentiful and jobs were scarce. Conditions have changed. There are too many places where a man may make a living and retain his self-respect, for a foreman to stand for much of the old-fashioned "jacking-up."

The track supervisor or roadmaster of today must handle his men more tactfully, not only because men are not so readily available, but because more is demanded of them, better training is required and a higher degree of intelligence and ability is necessary. These qualifications are largely a matter of training and intelligent direction of effort. Even the most experienced men require constant instruction if they are to meet the changing conditions.

The division engineer, the roadmaster and the track supervisor not only have the advantage of a wider field of experience to enable them to grasp quickly the need or desirability of new methods or better practice, but the various associations to which large numbers of them belong place at their disposal the experience of hundreds of their fellows. The foreman has no such advantages and must look to these officials for instruction. The training of the young foreman is both more difficult and easier than that of the more experienced man. He has more to learn, but he is frequently more open-minded than an older man. His ideas and methods are not so firmly fixed, and he more readily appreciates his need of instruction, while the older man, with his more firmly fixed ideas, does not see the value of new methods so readily, and, unless properly handled, is likely to adopt a change because he has to, and not because it appeals to him. This does not make for the best work.

Proper instruction implies a careful study of the individual foreman, for, save in the broader principles of handling men, there is no such thing as a fixed method. The method must vary with the man and must be individual in character.

A great deal of time must be spent on the ground with the foremen. Is a man not handling his work properly? Is he getting full value for the labor expended? The only way to get at the bottom of his difficulty is to work with him. Three or four days or a week spent in this way will not be wasted time. When the trouble is found, show him the why as well as the how. If he still fails to improve, be sure he understands, then talk the matter over with him, man to man, and warn him of discipline or discharge before going to that step. Anger and abuse cause sullenness or loss of confidence, and no man does good work when in either of those conditions.

A fair, manly attitude toward the men breeds a mutual respect between supervisor and foreman and a self-respect and self-confidence in the foreman, and it increases loyalty and produces contentment. These make for open-mindedness, intelligent and constructive thought, and real efficiency.

J. T. BOWSER,

Maintenance of Way Department, Queen & Crescent Route.

NEW BOOKS

Proceedings of the American Railway Engineering Association. 6 in. by 9 in., 1,400 pages. Illustrated. Bound in half morocco, cloth or paper. Published by the American Railway Engineering Association, Karpen Building, Chicago. Price, half morocco, $7.00; cloth, $6.50; paper, $6.00.

The volume this year contains fewer pages by 172 than last year, but owing to the larger number of inserts and the necessity for using heavy paper for a large number of plates it is actually thicker than the preceding one. Of the total number of pages, 780 are devoted to reports, 144 to discussions and 467 to monographs. Extensive work was done by all of the committees, but owing to the custom of continuing the work from year to year, the reports of a number of the committees were in the form of progress statements that did not indicate the true value of the work being done. In the case of the committee on iron and steel structures, on the other hand, the report given this year represents a digest of the work extending over a long period and for that reason constitutes one of the most valuable portions of the proceedings. Definite recommendations are made relative to secondary stresses, impact and working stresses based upon the results of tests and other investigations. The most important action taken by the association in its convention last March was the adoption of the report of the committee on rules and organization covering the standard clearances for bridges and other structures. The large amount of discussion which this entailed is particularly interesting. The reports of the committee on rail contain the usual annual review of the rail failure statistics, a report on internal transverse fissures, a study of 108 rail failures by W. C. Cushing involving a large number of illustrations, and an account of the nick and break test in the inspection of steel rails by Robert W. Hunt and C. W. Gennet, Jr.

The report of the water service committee gives an interesting account of the practice in protecting water stations from freezing. The report on masonry includes extensive notes on the appearance, wearing qualities and cost of surface finishes for concrete. Stone ballast by contract forms an important part of the report of the committee on ballast and is amplified by discussion on the floor of the convention.

Among the more comprehensive treatments in Part 2, covering the personal monographs, may be mentioned a report on special steels by W. C. Cushing; one on ballast tampers by George W. Vaughan, and two reports by Earl Stimson on the standardizing of maintenance of way work and a test of track bolts and wrenches.

A report on tests of treated and untreated Douglas Fir stringers by H. B. MacFarland includes extensive tables and diagrams. Two shorter reports were included: "Rise and Fall," by C. P. Howard, and "An Exceptional Flood," by J. L. Campbell. The book this year contains several series of unusually good illustrations, particularly those given with the reports on causes of rail failures, the nick and brick test, special steels, and the testing of Douglas fir stringers. These add materially to the value of the Proceedings.

RECLAIMING MAINTENANCE MATERIALS

Discussions of Different Phases of This Important Subject by Three Contributors to the Contest

Piles of Reclaimed Materials at the Seaboard Air Line Reclamation Plant

THE prize-winning paper in the contest on the Reclamation of Maintenance of Way Scrap Materials was published in the *Railway Maintenance Engineer* for October. The paper winning the second prize is published below, followed by two other contributions treating of somewhat different phases of the problem, which were received at the same time.

THE SANTA FE SCRAP YARD

By Andrew Graham

Assistant General Foreman, Reclamation Plant, Atchison, Topeka & Santa Fe, Corwith, Ill.

Not many years ago a Santa Fe blacksmith, repairing tools and doing various odd jobs in his line of work in a box car in odd moments began repairing track tools for the section foreman. To replace broken parts of these tools he went through the scrap cars to find good parts. This man secured enthusiastic support in his repairing work from the general purchasing agent, who moved the scrap yards from Topeka, Kan., to Corwith, Ill., about this time. Scrap from all over the system was sent to this yard to be disposed of. The classification of scrap was constantly changing and Chicago afforded the only market, so greater efficiency was expected from direct contact with the scrap material by the consumer.

The movement for gathering in one central place the scrap of the 11,000 miles of road gave birth to the thought of reclaiming all the useful material. The result has been far beyond expectations. Formerly with scrap sorted at several points or sold in carload lots the real loss was not realized.

A shop was built with about 3,000 sq. ft. of floor space for blacksmiths to repair track tools and work over old bolts and round iron. The shop had to be enlarged within a year. The next year two more shops were built and the old one was enlarged. Each year for seven years the floor space was increased. At present 50,000 sq. ft. of floor space is in use and a new steel building is now under construction, adding 17,500 sq. ft. for the operation of a five-stand rolling mill.

The personal supervision of this department by the general purchasing agent has made this a distinct department. Because of this separate organization, the overhead charge is cut and new and raw materials are more quickly procured from manufacturers.

In any new departure, the proof of its efficiency lies in results. This growing department of scrap reclamation has consistently justified the expenditure of $100,000

SHOP ORDER STATEMENT, CORWITH SCRAP YARD, A. T. & S. F. RY. CO.

First Three Months, 1916.

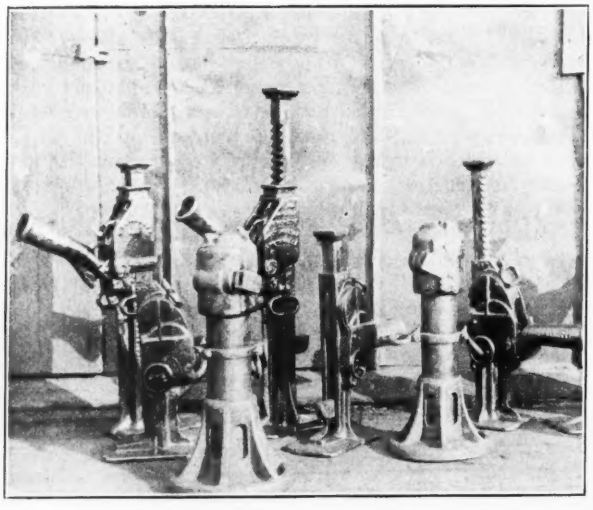
Article.	Number Repaired.	Material Used.	Labor	Shop Expense Supervision.	Total	Value New.	Net Saving.
Track Shovels	1,665	$ 86.04	$153.48	$ 4.20	$ 243.72	$ 965.70	$ 722.18
Ballast Forks	257	6.14	18.86	.84	25.54	173.66	277.72
Scoop Shovels	196	43.09	15.79	.47	59.35	74.01	14.66
Track Spikes—Kegs	83	86.60	23.00	9.79	119.39	290.00	170.61
Star Switch Stands	65	82.14	39.48	15.78	137.40	677.44	540.04
Ground-Throw Switch Stands	52	26.19	25.65	12.39	64.23	450.63	386.40
Rail Tongs	94	6.87	16.61	7.51	30.99	114.68	83.69
Track Drills	176	178.64	61.82	28.87	269.33	1,289.95	1,020.62
Clawbars	546	376.40	96.26	47.50	520.16	775.32	255.11
Lining and Timber Bars	347	43.80	62.18	32.21	138.19	142.90	174.71
Tamping Picks	5,020	813.00	638.86	322.83	1.774.69	2,697.94	923.25
Dirt Picks	544	29.52	51.98	29.05	110.60	195.84	85.24
Norton Jacks	94	233.35	60.23	30.23	323.81	1,531.90	1,208.09
Barrett Jacks	192	226.64	73.60	36.33	296.57	851.43	554.86
Track Chisels	483	15.57	58.43	27.94	101.95	262.66	160.71
Spike Mauls	661	30.66	70.72	33.83	135.21	413.21	268.00
Tamping Bars	334	172.78	62.87	25.53	261.18	377.42	115.24

for the machinery now in operation. The total figures in the recapitulation of the monthly shop orders for the calendar year of 1915 are as follows: Material used, which includes the scrap value of the old material as well

RAIL AND FROG STORAGE

as the cost of the new material used, $624,085.52; labor expended, $88,598.88; shop expense and supervision, $38,143.60; total cost of repairs, $750,828, value as new, $1,047,209.51, making net profit of $296,381.51, or $1,000 for every working day.

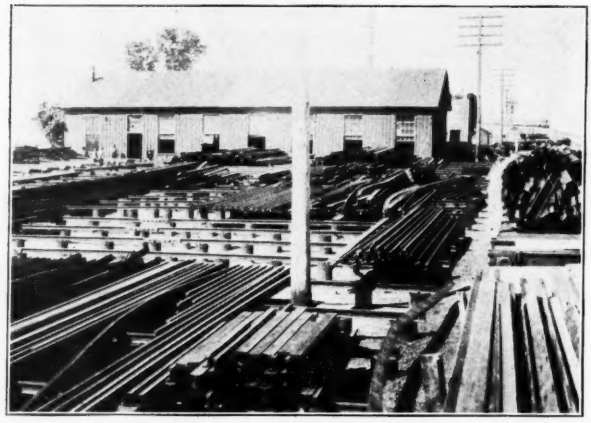
The maintenance of way scrap reclaimed has been holding its own with the mechanical and that from other scrap departments as a revenue producer. The accompanying table gives an idea of the cost of the repairs and the saving made on different track tools repaired the first three months of this year.



REPAIRED TRACK JACKS

In addition to the items given in the table 10,000 tie plates are reclaimed each month and put back into service; 1,000 rail joints and angle bars are reclaimed each month, and tinware, such as water buckets, dippers, oil cans, sprinklers, etc., used by the section men are made out of second-hand galvanized iron car roofing. This department clears $500 net each month. Track bolts rendered useless on account of rust are worked over, oiled, sorted and issued back on requisitions. Slow signs are made out of scrap sheet iron and scrap pipe. Milepost signs, bridge signs, etc., are manufactured from scrap pipe and sheet iron. Bridge bolts and drift bolts are all made of scrap rods. Drain pipes for crossings and culverts are picked out of scrap. Snow and cane brooms are made at this plant, using the old handles. Bumping-post rails are made from scrap rails. In fact, everything that can possibly be manufactured from scrap is made at the yard, requisitions being sent here before the material is purchased and experts selected from the different departments of the railroad go over them, picking out the items they can reclaim or make from scrap.

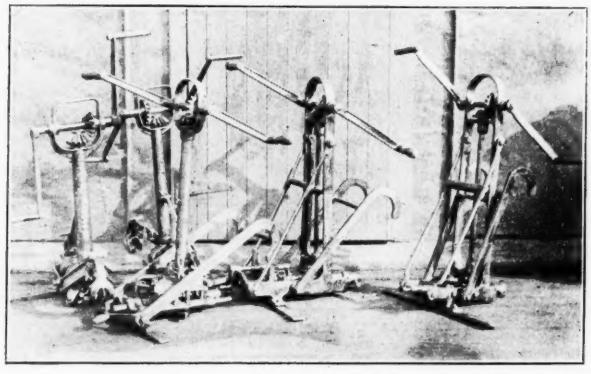
The Santa Fe rail mill is located at Newton, Kan., where frogs, switches and guard rails are repaired. Scrap rail is shipped in from all over the line and sorted for different uses, such as relaying, sidings, frog and switch material, guard rails and scrap. A scrap frog is taken apart and credit allowed to the division from which it came, for good serviceable parts. Frogs that can be repaired at a small cost are taken in at the price of new and the division scrapping them is charged with the material and labor expended for repairs. The frog then is



PILES OF RECLAIMED RAILS

issued to the line at the price of new. Frogs are also made from second-hand rail and the serviceable parts taken from scrap frogs.

At the present time the entire output of the shop is devoted to the repair and making of frogs. There were 1,436 frogs repaired during 1915 and 196 bridge points were made. The value of the new material used amounted to $3,260.70, the amount spent on labor was $8,912.06, and the overhead expense $2,148.94, making a total cost of $14,321.70. The cost, if purchased new, would have



REPAIRED TRACK DRILLS

been $50,178.13. This makes a net saving to the company of $35,856.43.

The assembling of scrap metal at one point might be advantageously done by some other roads for several

reasons. When tools break on a section they are thrown in a scrap car and forgotten. The accumulation from thousands of miles of line with the opportunity for inspection to ascertain the possibility of repairs, or of defects or weak places, is surprising. Representatives of railway supply houses visit the yard daily and examine their own products after they have gone through weeks or months of service. Not long ago 867 tamping picks were replaced by a manufacturer because of a defect in one spot. Oftentimes a change of design results in an improvement which is participated in by all railroads.

Repeated handling of tools makes men expert in repairing them. Tools repaired at different points show inferior workmanship. A blacksmith not used to handling tool steel each day gets out of practice. Tools repaired at each division point only afford a blacksmith about one day's work per month, while at the reclamation plant one man works continually on picks, another on clawbars and another on chisels, etc. Suggestions from roadmasters and section foremen regarding their requirements are more readily given and received at one central point. These men may meet at such a point and profit by what others are doing along the road, as well as give ideas of reclaiming this scrap material.

The maintenance of way scrap is handled very conveniently by a supply car covering a given territory. The car is loaded with tools and supplies which are issued to the different sections upon the return of the old tools with requisitions for the new ones. The old tools are taken to the nearest storehouse by the car and from there shipped to the reclamation plant. Thus they are kept in circulation. Officials and workmen like the plan and work in harmony to promote the new-found science of saving.

THE PRINCIPLES OF RECLAMATION

By J. G. Talbot

Foreman, Reclamation Plant, Seaboard Air Line, Portsmouth, Va

There should be no distinction between the reclamation of the maintenance of way material and that of any other department. Theoretically, reclamation should begin with the user and be refined upward. In practice, it begins at the assembling point and is refined downward.

The first requisite is to install a method of assembling the scrap systematically and regularly. The supply train offers the only practical service. The assembling and reclamation plant should be organized on broad enough lines to take care of all operations, including the sorting and handling of the scrap. The track layout should be such as to avoid all unnecessary handling. The reclamation tools should be arranged in sequence. For the same reason the reclaimed material should be stored and shipped, or delivered, directly from the plant.

KEGS FOR SORTING BOLTS AND NUTS

An accurate record of the unit cost of the work must be kept which must take into consideration the salvage value of the material, all expense connected therewith, and its proper proportion of overhead, so that it may be known at all times what the unit actually costs. This is necessary in order that the reclamation of any article may be discontinued promptly when it is shown that it costs more than it can be purchased for new, less the salvage.

Sufficient and modern tools should be installed and proper supervision must be maintained to do the work

ONE PART OF THE SEABOARD RECLAMATION PLANT

well and cheaply, and develop it. Reclamation work will develop every day in proportion to the perfection of the organization and the intelligence of the supervision. The gradual refining of this work will have the effect of lessening the amount of reclamation, and the men on the sections, in the shops and elsewhere will gradually learn by forcible lessons, and discipline if necessary, the need of closer supervision and care in the use of materials, for

STRAIGHTENING SPIKES

it is recognized that the real service consists in obtaining the fullest service from the material before it is removed. The conditions under which men work will make it impossible for them ever to overcome losses in this way entirely, and it will always make it necessary to have a general assembling point where material can be carefully analyzed and salvaged.

A supply train is used for picking up all scrap and surplus and obsolete material to be worked over. This train operates over the different divisions on a prearranged schedule, giving a 60-day service. Section foremen and their men meet the train and obtain from it the necessary supplies, and at the same time loading all scrap and surplus. Roadmasters accompany this train and know whether or not the supplies delivered are in the required amount and if the scrap and tools turned over have served their purpose. On the first trip of the supply train on three divisions, there was picked up as surplus tools and tools needing repairs, 2,022 picks, 525 clawbars, 386 track chisels and 133 track jacks. By picking up scrap at regular intervals congestion is avoided at the reclamation plant and the loss of many tools and much scrap is obviated.

Regardless of the fact that foremen have instructions to use all serviceable spikes, almost any large road can pick out and straighten 75 to 100 kegs of spikes per month. These when rattled make serviceable spikes for side track use. Bolts can be picked out and soaked in crude oil and many kegs reclaimed per month.

Rail is one of the expensive items on the railroad and very little attention has been given to its reclamation. A properly laid out yard equipped with a friction saw, rail drill and straightening machine will make many tons of rail serviceable, either for selling or for use on side tracks. The best short pieces of rail can be saved out and used for frogs or guard rails.

Roadway scrap, if carefully sorted, will be found to yield astonishing amounts of good angle bars, tie plates, braces, joints, etc., many of which can be used again, and if there is a surplus they can be sold to many small users. The assembling of scrap as far as possible at one point will justify the purchase of cranes and magnets to do the work properly and economically. Scrap can be handled by cranes and magnets for one-fourth the cost of doing it by hand.

While it is felt a great deal has been done in the reclamation of material, actually the surface has only been scratched, as far as opportunity is concerned, but what we have done has been done with full knowledge of the principles involved and the plan has been laid out in an economical and practical manner and is capable of being largely extended as conditions will warrant.

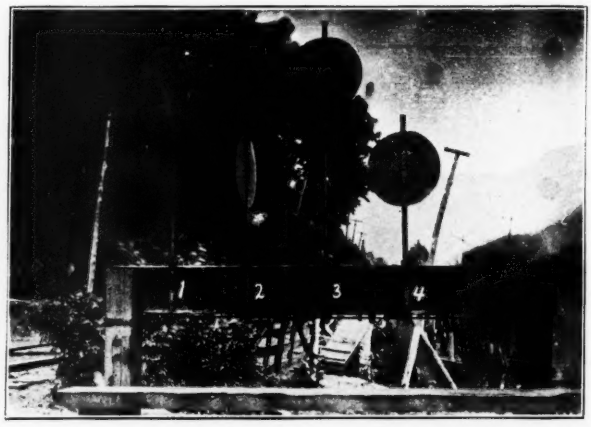
The following list of equipment will give an idea of the work the Seaboard Air Line is doing along this line:

Spike-straightening machine.
Rattler for spikes.
Vats for soaking bolts and nuts.
Rail saw.
Rail drill.
Rail straightener.
Facilities for repairing jacks, drills, rehandling shovels, etc.
Magnetic brass separator.
Brake beam repair shop.
Spring reclaiming plant.
Nut tappers.
Bolt threaders.
Bolt shears.
Bolt-straightening hammers.
Large alligator shears.
Large hammer for general work.
Washer machine.
Acetylene cutting and welding apparatus.
Cranes and magnet.

RE-USING WORN MATERIALS

By Charles Williams
Supervisor, Kanawha & Michigan, Quincy, W. Va.

A scrap car is run over the division on the local freight on the first Tuesday of each month. All section foremen



SCALE TRACK SIGNAL MADE FROM SCRAP

have standing instructions to bring the scrap in each evening to the scrap bins located at tool houses, and to be on hand each scrap day to load their accumulations into the scrap car, together with any other material taken out of the main line and sidings that they have no immediate use for. The loaded scrap cars are shipped to the scrap yard, where the mechanical department as well as the maintenance of way department scrap is sorted. All

spikes that are fit for further use are straightened. The good wings of frogs are saved and used to repair other frogs. Frogs that are not fit for main line use are used in sidings and mine tracks, where, after being bolted new throughout, they give a number of years' service.

The manganese tip switch points that break where the manganese connects with the point are repaired by taking a bridle rod out of the scrap and drilling it to fit the holes in the switch point. The bridle rod is then bolted to the point with ¾-in. bolts, which makes the point as good as new at a cost of $0.35. We have eight points repaired in this manner, and two have been in use over one year on the ladder track of the load yard, where an average of 400 cars per day pass over them. In addition, all the engines use this track in going to and from the roundhouse.

The defective rails removed from the main line are turned and used in house and mine tracks, and the light rails recovered are sold to coal companies for motor tracks at the relay price. The scrap rails over six feet long are piled, and when enough are accumulated are sold on sales order, the same being done with rails under six feet long.

Damaged and worn switch stands are taken apart and the good pieces are saved and used for repairs. The Ramapo switch stands that become damaged or worn are repaired by purchasing the necessary pieces from the makers. The accompanying picture shows a scale track signal that was made from a piece of scrap floor beam from a bridge, and four staffs of high-target switch stands that were recovered from scrap. This signal is used in the receiving yard to indicate which tracks are blocked, and eliminates the danger of heading a train onto a blocked track. This signal was made at a labor cost of $5.25.

Scrap frog points are used at the ends of guard rails on bridges. Tie plates that are worn and unfit for the main line are drilled to fit smaller rails and are used on yard tracks and branches. Tie plates are drilled in the shops at a cost of 1½ cents per plate, and, considering the cost of new plates and the length of service obtained under light rail, a large saving is made.

Rail Failure Statistics for 1915

THE annual analysis of the statistics of rail failures prepared by M. H. Wickhorst, engineer of tests for the Rail Committee of the American Railway Engineering Association, appear in bulletin No. 188, which has just been issued. This report includes the statistics of rail failures for the year ending October 31, 1915, and is based upon information furnished by the railways of the United States and Canada in response to a circular sent out by the American Railway Association. The report covers the rollings for 1910 and succeeding years. The tonnage included in this report amounts to 7,397,699 tons of rails, of which 1,384,858 tons is of Bessemer rails and 6,012,841 tons is open-hearth rails. As is to be expected, the Bessemer rails show a continually decreasing proportion of the total tonnage. The following data is abstracted from the report:

It is interesting to note the comparative performance of Bessemer and open-hearth rails for the several years' rollings. Figuring the failures per 100 track miles of open-hearth rails as 100 for each of the years 1910, 1911, 1912 and 1913, the relative failures of the Bessemer rails, together with the failures per 100 track miles, is shown below:

FAILURES OF OPEN-HEARTH AND BESSEMER COMPARED

Year Rolled	Years' Service	Failures per 100 Track Miles		Comparative Failures	
		Open-Hearth	Bessemer	Open-Hearth	Bessemer
1910	5	153.1	236.9	100	154
1911	4	115.5	178.8	100	155
1912	3	46.0	66.9	100	143
1913	2	24.8	35.2	100	142

It will be noted that the Bessemer failures per 100 track miles were about 50 per cent greater than those of the open-hearth rails. It is probably also true that the open-hearth rails were, in general, in more severe service, so that the actual difference under the same conditions may have been greater.

The comparison between open-hearth and Bessemer rails as obtained from the statistics in the 1913 and 1914 reports and this report are collected together below. The original comparisons in the 1913 and 1914 reports compared the failures per 10,000 tons, but below the comparison is on the basis of failures per 100 track miles, although the difference is small.

BESSEMER FAILURES COMPARED WITH OPEN-HEARTH FAILURES TAKEN AS 100

Year Rolled	Years' Service			
	2	3	4	5
1908	.....	.....	.....	112
1909	.....	.....	195	188
1910	.....	230	207	154
1911	249	291	155	.....
1912	219	143	.....	.....
1913	142	.....	.....	.....

In order to show more conveniently the relative number of failures from each of the mills and to show the ranking of the mills as regards the failure performance of the rails rolled by them, one of the accompanying tables has been prepared. Taking the average number of failures per 100 track miles of all the mills in each group (Bes-

COMPARISON OF FAILURES FOR THE DIFFERENT MILLS, USING 100 AS THE AVERAGE OF FAILURES OF ALL MILLS FOR EACH YEAR'S ROLLINGS

Mill	1910		1911		1912		1913	
	Relative Failures	Rank	Relative Failures	Rank	Relative Failures	Rank	Relative Failures	Rank
BESSEMER								
Illinois	86.9	2	99.4	3	81.9	1	79.0	3
Maryland	77.3	1	35.9	1	97.0	2	165.3	5
Lackawanna	92.6	3	155.0	5	151.7	3	74.4	2
Cambria	171.2	4	138.2	4	188.8	4	57.1	1
Carnegie	203.5	5	88.8	2	212.1	5	84.7	4
OPEN HEARTH								
Tennessee	35.8	1	36.7	1	95.4	5	66.5	2
Colorado	39.8	2	47.3	2	120.9	7	44.4	1
Pennsylvania	80.9	4	107.0	6	59.8	2	84.7	4
Carnegie	66.0	3	110.7	7	120.2	6	78.2	3
Illinois	134.7	8	96.8	4	85.3	3	88.3	5
Lackawanna	97.2	5	97.7	5	86.1	4	126.7	7
Maryland	106.3	6	52.6	3	39.3	1	298.8	9
Bethlehem	216.1	9	226.4	9	113.3	8	108.5	6
Cambria	131.3	7	204.8	8	161.5	9	199.6	8

semer and open-hearth), in any year's rolling as 100, the relative number of failures of each of the mills is shown for the years 1910, 1911, 1912 and 1913. The later rollings are not included because of being too recent. The rank of each mill is also shown for each year's rolling.

One important purpose of these statistics is to enable comparisons to be made of the performance of rails rolled from year to year. The final comparison is made on the basis of five years' service, but before closing the record of any one year's rolling, a comparison can be made on the performance of a less number of years in service. The records are closed for the 1908, 1909 and 1910 rollings and it is noted that both the Bessemer and open-hearth rails showed reductions in the number of failures in the successive years.

The average number of failures per 100 track miles of the rollings for the several years, including both the Bessemer and open-hearth rails, is given in the following table:

Year Rolled	Years' Service 0	1	2	3	4	5
1908	.....	.....	.....	.....	.....	398.1
1909	.....	.....	.....	.....	224.1	277.8
1910	.....	.....	.....	124.0	152.7	198.5
1911	.....	.....	77.0	104.4	133.3	.....
1912	.....	28.9	32.1	49.3	.....	.....
1913	2.0	12.5	25.8	.....	.....	.....
1914	1.2	8.2	.....	.....	.....	.....
1915	0.7	.....	.....	.....	.....	.....

A study of the results shows that the 1908, 1909 and 1910 rollings have successively decreased numbers of failures compared on a basis of five years' service and the later rollings also show successive reductions in failures when compared on a less number of years' service. This is due partly to the gradual replacement of Bessemer by open-hearth rails, and partly to the improvement in both the Bessemer and open-hearth records.

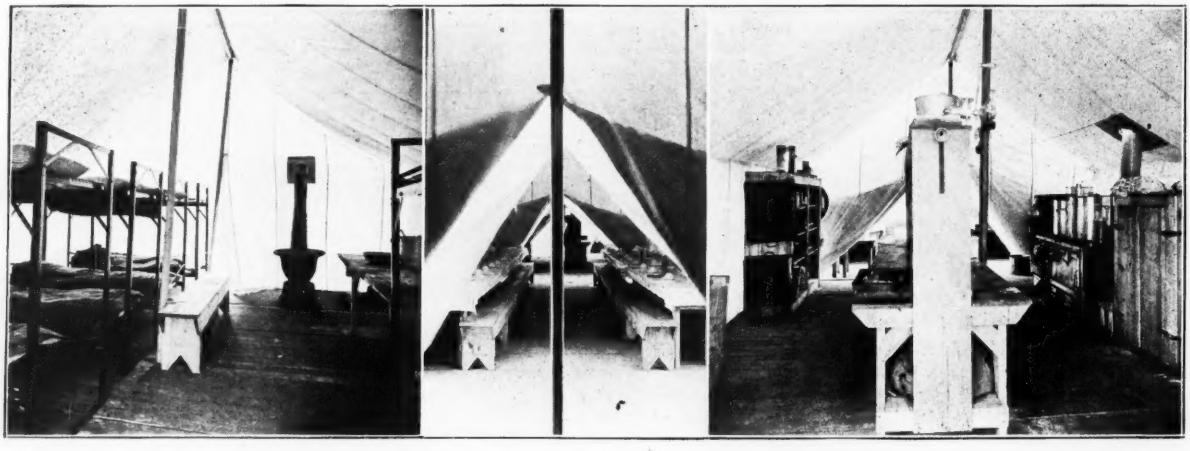
Camp Equipment for Extra Gangs

THE Buffalo, Rochester & Pittsburgh is replacing box cars with tents for the housing of its extra gangs engaged in track work with excellent results. The standard equipment for a gang of 150 men consists of:

2 16-ft. by 24-ft. tents for bakery and kitchen.
4 16-ft. by 24-ft. tents for dining quarters.
13 16-ft. by 24-ft. tents for sleeping quarters.
1 16-ft. by 24-ft. tent for the foreman and timekeeper, for sleeping quarters and office.
1 10-ft. by 12-ft. dining tent for the foreman.
1 10-ft. by 12-ft. tent.
1 12-ft. by 14-ft. tent for the cooks, commissary clerk, etc.
1 16-ft. by 20-ft. portable steel building for the commissary.

A 16-ft. by 24-ft. tent equipped with six double deck steel bunks, a stove, a lamp and a table provides comfortable sleeping quarters for 12 men. A tent of the same size will provide a dining-room for 48 men, while one of this size is adequate as a kitchen and bakery for a gang of 50 to 60 men. The kitchen is equipped with a large cooking range of a size depending upon the number of men in the camp. All of the tents have sectional floors to facilitate moving. The railway provides all

A TYPICAL CAMP ALONG THE TRACK



INTERIORS OF THE BUNK, DINING AND KITCHEN TENTS

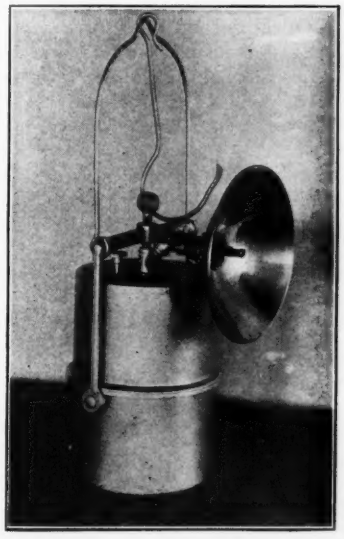
equipment except the kitchen utensils, dishes, mattresses, blankets, lamps and the kitchen range. Each camp is equipped with an ice box, ice being furnished by the company two or three times a week.

The cook and all the kitchen and dining-room employees are furnished by the labor agent and work under the direction of the commissary clerk. The railway furnishes one man at each camp who is responsible to the foreman for sanitary conditions. The sleeping tents are swept daily and the floors are scrubbed twice each week. The floors in the kitchen tents are scrubbed each day and in the dining tents every second day. The foreman and the commissary clerk exact cleanliness from the laborers, neglect in this matter being sufficient cause for dismissal. The use of steel bunks has been found to result in materially improved sanitary conditions as compared with those existing in the camp cars and wooden buildings formerly used, which it was practically impossible to keep clean and free from vermin.

Where foreign gangs are employed no cook or dining tents are furnished, as these men prefer to do their own cooking out of doors. The location of a camp is given the personal attention of the labor agent and the roadmaster, who consider each site from the standpoints of proper sanitation and an ample supply of pure spring water.

A NEW ACETYLENE LIGHT

THE Alexander Milburn Company, Baltimore, Md., has introduced a new acetylene gas lamp for use on construction work, known as Milburn Light No. 22, which has a capacity of 100 cp. for a period of eight hours without recharging. The special feature of this lamp is the arrangement for varying the position of the flame. The lamp may be ordered with a simple burner set at 45 deg., with or without a wind shield, or it may be provided with a movable burner, which may be set at any angle from horizontal to vertical. This is a convenience where it is especially desirable to direct the light to secure a certain distribution or intensity of light at a given point. This burner may be used with or without a reflector. The wind shield, which is useful in outdoor work in the case of high wind, is made of transparent mica, with metal protecting edges and ribs. It is easily attached or removed from the burner.

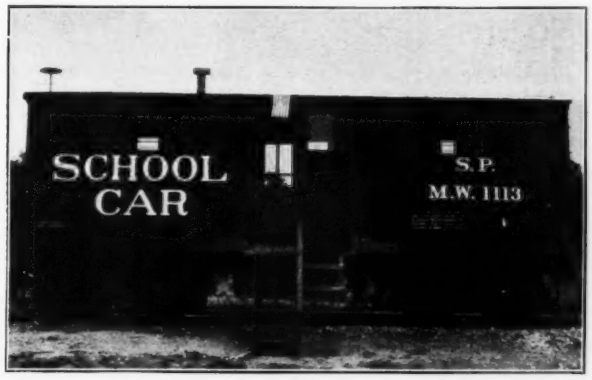


THE ACETYLENE LANTERN

The lamp consists of a plain cylinder, 6 in. in diameter, made of seamless steel stampings with fittings of steel and malleable iron. The total height of the lamp over the bail is 11 in., and it weighs eight pounds when loaded. The carbide charge is one pound. The water feed is automatic, generating the gas only when needed, and is controlled by a needle valve on top. The carbide chamber is arranged for easy charging and dumping, and the water chamber has a funnel at the top to facilitate filling.

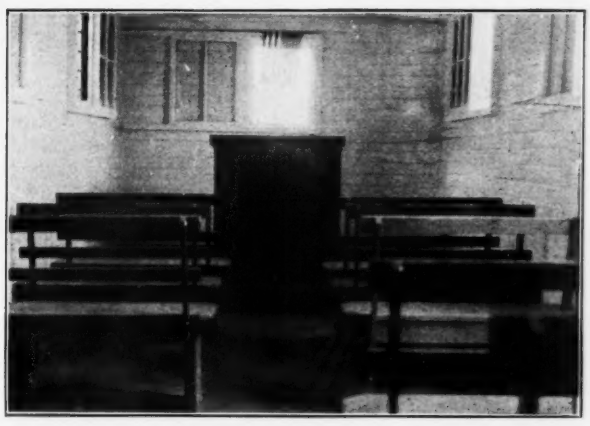
SCHOOLS FOR TRACK LABORERS' CHILDREN

THERE are many localities along the railroads in the Southwest, where sparse population and undesirable physical conditions produce very unsatisfactory living conditions for the men located at way stations along the line. Public instruction is frequently not available for the children of such employees. Realizing that these conditions are not conducive to efficient, steady and satisfied employees, the Southern Pacific has made a consistent effort to provide ways and means of improving the conditions as much as possible. Living quarters are made attractive, shade trees are planted, water is provided in abundance and provision is made for the schools wherever practicable. In a number of cases school buildings have been built at the expense of the railroad company and telegraph operators have been granted overtime for trips made on motor cars twice a day to convey children to and from the schools.



AN EXTERIOR VIEW OF THE CAR

The Mexican labor commonly used in the track forces has introduced a further problem, because even when organized in extra gangs these men move their families with them. The children in these gangs are deprived ordinarily of any educational opportunities.



THE INTERIOR OF THE CAR

This has been overcome in one gang by establishing the school car shown in the accompanying photographs. The interior of the car is made as attractive as the equipment in bunk car service will permit. The teacher is generally the wife of the timekeeper in the extra gang, special pains being taken to select a timekeeper who has a wife who is competent to carry on this work. The

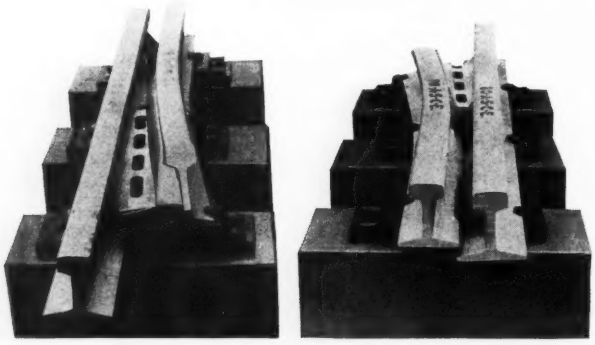
shifting of the extra gang from point to point does not interfere in any way with the continuity of the instruction, as the school car is moved with the rest of the camp equipment.

It has been found that the Mexicans respond immediately to this treatment and the company has been amply repaid in more efficient work and longer terms of service on the part of the men. The laborers have manifested their appreciation particularly of the opportunity for educating their children. In a number of instances, daughters of laborers have graduated from high schools.

W. H. Whalen, superintendent of the Los Angeles division on which this car is operated, has made arrangements to obtain an old passenger coach which will be fitted up with benches and blackboards and which will be easier to heat, expecting in this way to improve materially the conditions in this unique school room. He has, furthermore, arranged to fit up a hospital car for the women and children in the camp who become ill.

THE BETTS GUARD RAIL

THE accompanying photographs show two views of one end of a Betts safety guard rail, which comprises construction details that differ materially from most other designs. The particular feature is the type of holder used, which combines the idea of a tie plate with the principle of a clamp, no bolts or independent clamps being used to connect the main and the guard rails. The two holders at the ends of the guard rail within the limits of the flare are of either malleable iron or cast steel. The intermediate holders are forged from rolled plates. Although entirely different in construction the principle is the same in the two types. The guard rail is secured at its base between a track spike on the outside and a lip on the holder on the inside, and the latter in turn is held down in place by the main rail and the load it carries. Consequently, the guard rail cannot lift up or roll without lifting the main rail. In the case of the intermediate wrought holders which are made in two pieces, any turning thrust of the guard rail is transmitted directly to the underside of the main rail head.



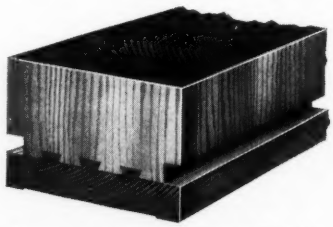
TWO VIEWS OF THE GUARD RAIL

Another feature of the guard rail is a malleable iron foot guard. This can be applied quickly after the guard rail has been spiked in place. It is slid in from the end, after which the key shown in the photograph is driven down behind a lug forming a part of the base of the end holder. It is removed just as readily by driving the key upward and sliding the foot guard out.

These guard rails have been used extensively by the Big Four and on the Terminal Railroad Association of St. Louis. They are also being used experimentally on a number of other roads in the Middle West. In recent investigations of several of these guard rails in use for over two years at frogs, they were to be found to have been unimpaired by the service. There had been no change in the opening between the heads of the rails, nor in the gage between the running rail and the point of frog. It was also reported that there had been no charge for maintenance against these guard rails since they have been installed. The forged guard rail holders used on the intermediate ties opposite frogs are also being used with guard rails on sharp curves, some of them having seen three years of service. These guard rails and holders are being placed on the market by the W. M. Mitchell Co., Louisville, Ky.

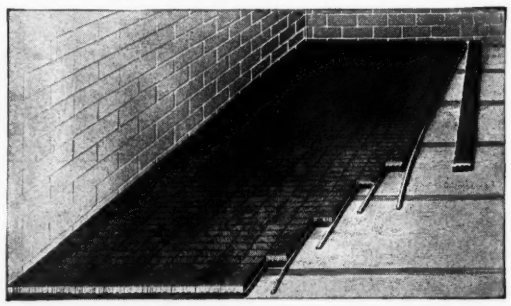
A NEW FLOORING

A NEW flooring, consisting of small wood blocks 1½ in. by 3½ in. in section set on end and dovetailed to a baseboard, is being put on the market under the name, "Bloxonend." It can be laid exactly like ordinary wood flooring—it can be laid directly on joints or over old floors, no special foundation being required. The sections are grooved for splines and can be joined easily and tightly. Bloxonend comes in strips about eight feet long, and is manufactured in several standard combinations. The "two-over-one" section is a combination of two-inch blocks on a one-inch baseboard. It can be made in special sizes with a thicker base, if required, for floors carrying extra heavy weight, built for heavy trucking. For mill construction it comes in laminated flooring up to 16 ft. with the blocks on the top edge, thus doing away with the necessity of laying a hardwood floor on top.



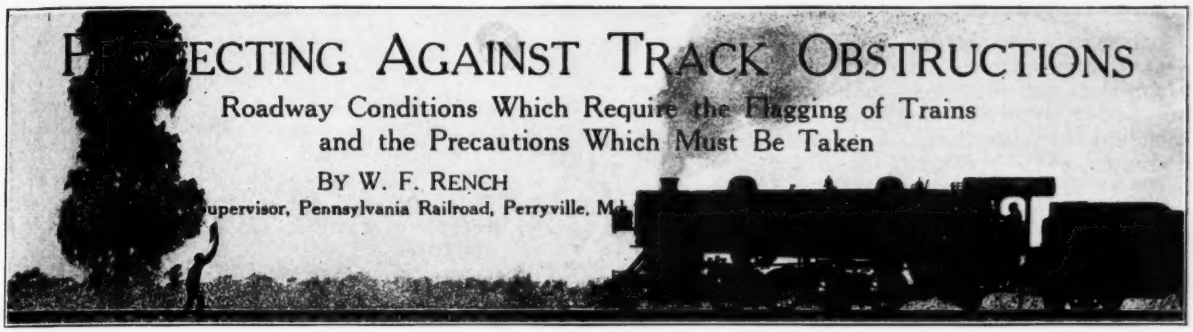
CONSTRUCTION OF THE BLOCK

The purpose of this flooring is to combine the rapid-laying advantage of the tongue-and-groove type of flooring with the good qualities of wood block flooring as to durability, smoothness, quietness and resilience.



METHOD OF LAYING THE FLOOR

It is claimed that this floor is suitable for a variety of purposes, applying in the case of railway installation to freight houses, station platforms, shops, etc. Bloxonend is the invention of C. J. Carter, and is handled by the Marsh & Truman Lumber Company, Chicago.



PROTECTING AGAINST TRACK OBSTRUCTIONS

Roadway Conditions Which Require the Flagging of Trains and the Precautions Which Must Be Taken

BY W. F. RENCH

Supervisor, Pennsylvania Railroad, Perryville, Md.

BY elaborating the rule somewhat, a track obstruction in so far as it relates to a maintenance condition, may be defined as any work which will not permit the passage of a train at full speed *with an ample margin of safety*. The provision expressed in italics is especially important by reason of the transition occurring in track practice. It is a well-known fact that conditions are sometimes found to exist which would be pronounced inadequate if gaged by the standard of a definite factor of safety. It is not enough that trains "get over all right;" they must be passed with such absolute assurance of safety that no single element of doubt is present. If the safety of a situation admits of argument a flag should be sent out at once against trains.

To meet the changing conditions in track construction it is essential that limits be determined for the various operations. The problem of applying the heavier sections of new rail is alone a serious question. The declining quality of the laboring forces, the frequency with which they change from place to place, and the loss of the native and experienced labor formerly counted upon, have made a new situation which must be met. Although the exact conditions that require protection will vary somewhat with the standards of maintenance of the road, it is thought that rules designed for use on a trunk line of high standards in maintenance will supply helpful suggestions in such determination.

A prime requisite for the efficient protection of traffic is a rigid requirement that the track forces shall have close at hand the proper appliances for conveying stop signals quickly in the event that a suddent emergency should require it. Whenever such a circumstance arises men with red flags or red lanterns are sent in each direction a sufficient distance to stop a train before it reaches the point of obstruction. They should also be equipped with torpedoes to be used in the manner prescribed by the rules. At the immediate place of danger a red flag or lamp is placed within constant sight of the men on the ground. In automatic signal territory a shunt rod should be used to set the nearest signal in the stop position. Information is also given the despatcher promptly so that notice of the obstruction can be delivered to trains.

It should be the first duty of every foreman to select with the utmost care and train with thoroughness men upon whom full reliance can be placed to supply unfailing protection. He must instruct them to flag every train until called in. The practice of allowing a flagman to pass certain trains while protecting is wrong and should never be permitted. While some loss of time may be suffered if he is called in and again sent out, the matter of safety far outweighs any other consideration. It is essential that the flagman shall be able to speak English intelligibly, as it is necessary for him to inform the engineer why he is being flagged. This information conveyed in broken English may lead to misunderstandings and a consequent accident.

The specific conditions which have been determined by careful study to exceed the limits of permissible departure from the ideal are given categorically. It is believed that adherence to these standards will always conserve safety without unnecessarily restricting maintenance operations. In the relaying of rail the following features are considered to introduce an obstruction to safe movement: A greater number of spikes withdrawn from a single line of rail than at every other tie; less than one bolt in either half of any joint or these not tightened; a poorly applied connection joint, introducing an offset in the gage line or a step from the higher to the lower rail; the loosening of all the spikes along the inside line of the rail through any part of the stretch to be relaid.

It is further required that the ties at the point of renewal shall be in the sound condition that should at all times be present in main line tracks. If the ties are not sufficiently sound, proper replacement should be made before the relaying of rail is attempted. The drawing of spikes is limited to a single line of rail because there is the possibility that the alternate spikes might be withdrawn from a different series of ties for the two rails and no protection against spreading of the rails be afforded. Accidents have occurred through such a condition being overlooked in the hurry of renewal.

It is required that two bolts be in place, one in each half of the joint, to assure that the rail will not pull apart while a train is passing over it. Wherever possible the difference in height of the two rails or the offset in the gage at a compromise joint should be no more than ⅛ in. The raising of the spikes is necessary where a rail section with a heavier base is being applied. While this lifting may be done in advance upon the outside line of the rail, it may not be done upon the inside line until the last train has passed. The laying of rail on the road under consideration is regarded as of such importance that this work on the main line is always directly in charge of an assistant supervisor; thus an officer of the company is responsible for the safety of operation.

A condition that is unsafe may be introduced by an improper manner of making tie renewals. The removal of two or more ties together, or the removal of more than four ties in any 33-ft. section of track, or the lack of full spiking or tamping at the ties adjacent to those removed, constitutes an obstruction requiring protection. The weight of rail in the track is the principal element in determining the permissible space between bearing surfaces. With 100-lb. rail where maintenance is good it is believed no obstruction will exist when the span is not greater than 27 in., or, for very short periods, while one tie is removed in renewal, when the span is no greater than 48 in. Such a condition should not extend beyond a few train movements and should never be left over night. It is preferable that the spaces should be maintained as far as possible within 18 in. The limiting maximum span should be reduced for less weights

of rail than 100 lb. in the ratio of the squares of the respective weights to the square of 100 lb., and may be similarly increased for heavier weights.

In raising track under high speed operation lifts greater than 2 in., requiring a measurable time to apply a run-off at least as moderate as 5/8 in. in 33 ft., or in any service, the use of the track jack within the rails, or a change of elevation greater than 1½ in., in 33 ft., constitutes an obstruction. Tests with the newer and stiffer equipment have shown that the side bearings will foul at the diagonally opposite corners when the rate of the run-off is greater than 1½ in. in 33 ft. In any maintenance operations a margin of practical working variation must be assumed, and it seems fair to propose ½ in. as the limit to which irregularity of elevation might go. If this limit is adopted the run-off may be established at a rate of 1 in. to 33 ft. If ¾ in. low joints might occur, a rate of ¾ in. to 33 ft. should not be exceeded. The rate where a speed above 45 miles per hour is permitted should not exceed ½ in. to 33 ft. These restrictions apply whether the change in elevation is at the approach to a curve, or a neglected depression in the grade, or the run-off when a single rail is being raised. To avoid this menace it is customary to raise both rails together and for greater comfort to the passenger the raising is made toward the traffic.

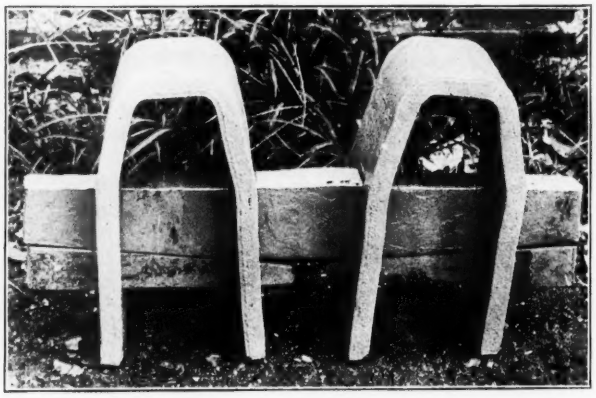
An obstruction in gaging track exists when the spikes are removed from more than every other tie on one side of the rail and removed or lifted from more than four adjacent ties on the other side of the rail at the same time. If, in spike lining, the gage should be tightened to less than 4 ft. 8⅛ in., or widened to more than 4 ft. 9¼ in., an unsafe condition would be introduced which would require flagging. From the fact that gaging must generally be done by laborers working in twos and threes, without the supervision of the foreman, this rule is important and should be carefully impressed upon those to whom this responsibility is entrusted. The condition stated may develop from rail running or track spreading out and the rule should be likewise impressed upon the track walker.

A track obstruction exists when both splice bars at a joint are broken entirely through, and similarly, when renewal is made of both splices at the same time. This work should always be delegated to two men so that one can supply the necessary protection. Any operation in lining in which the throwing exceeds that usually done in ordinary maintenance is an obstruction. It is not necessary, except in special cases, to do the lining in a manner to cause an obstruction. It should always be done gradually so as not to introduce any menace to the traffic.

The matter of working to the exact standards set for the various processes is of such consequence that several roads now require efficiency tests to be made regularly to determine compliance with the rules. These tests are made by the supervisor and also by the members of the safety committee. The results of the tests are recorded and violations of the rules are adequately punished. Tests are made by the division engineer when rail-laying is in progress to determine that the supervisor or assistant supervisor is in charge of the work. The renewing of ties is strictly the work of the foreman and this item is specially observed. The tests are made by surprise and the aim is to try each foreman once a month. The other items of work, such as gaging, changing splices, raising track and lining are occasional and tests are made as opportunity presents. If the records show a foreman failing persistently he is demoted and a more careful man placed in his stead.

A NEW TYPE OF FALSEWORK

AN excavation under a track either for a small pipe trench or for a bridge of considerable proportions, calls almost invariably for the conventional falsework with its span of bridge stringers supported on mud sills or—if the requirements are still more severe—on pile bents. This form of construction necessitates the disturbance of the ballast for the full length of the stringers with still deeper excavations into the roadbed to place



THE SUPPORTING SADDLE

the mud sills or caps. The result is that the track is disturbed for a much greater distance than is called for by the excavation for the pipe or other structure which is to be passed underneath.

The operating requirements of practically all side and yard tracks and of a large proportion of the main tracks in this country are such that the track ties on either side of any small excavation can be relied upon as the support for the load carried across the opening, providing the rails can be properly reinforced or supported. The problem has been to provide a means for carrying the rail load without going underneath the ties. This is solved in the Bohannan Excavation Rails, shown in the accompanying photographs. The running rails are reinforced by auxiliary rails placed on top of the ties at either side and the load of the running rail is transmitted to the

THE RAILS IN POSITION

auxiliary rails by the use of one or more clamps of such design that the entire structure can be applied without disturbing the beds of any of the ties.

The character of the clamp is illustrated in detail in one of the photographs. It consists of two yokes which are placed over the auxiliary rails and to which the load

of the running rail is transferred by means of a saddle block which spans between them. All parts are firmly secured by means of two keys that are driven home after the construction has been assembled.

The device is simple and capable of ready mathematical analysis and as the weight of the auxiliary rails may be varied from 60-lb. to 100-lb., the number of separate clamps used being optional, and as the limiting span lengths may be changed as desired, it is possible to ad-

TOP VIEW OF THE CONSTRUCTION

just the construction as found necessary to provide adequately for the character of the traffic on various classes of tracks. Any rails available may be used, but it is preferable to provide special rails with the heads bent down at the ends as shown in the photographs.

This device has been used by a number of railroads and large industrial companies, particularly in yards. Among the railroads may be mentioned the Elgin, Joliet & Eastern and the Duluth & Iron Range. The device is being sold by the Bohannan Easer Joint Company, Ensley, Ala.

A NEW GUARD RAIL CLAMP

THE Reading swing or flexible guard rail clamp is designed to permit the placing of the guard rail without the need of pulling the spikes or moving the guard rail. It also has a flexible bearing which eliminates much of the stress which ordinarily results from the binding or bending taking place as wheels pass over the track. The clamp consists of five pieces, a yoke, two filler blocks, one outside block and a wedge block, all of which are of cast

THE GUARD RAIL CLAMP

steel, thus permitting the distribution of the metal to the points of greatest stress.

These clamps are manufactured in three sizes, namely, the LC size for the 100-lb. A. S. C. E. section and all others up to and including 135 lb., the MC size for all sections from 70 to 100 lb. inclusive, except the 100-lb. A. S. C. E. and the SC size or all sections up to and including 65-lb. rails. Filler blocks are furnished according to the section of rail to be used. These clamps are now in use on the Pennsylvania Railroad, the Reading, the Baltimore & Ohio and the Southern. They are made by the Reading Specialties Company, Reading, Pa.

STEP-SPLICES FOR WORN RAILS

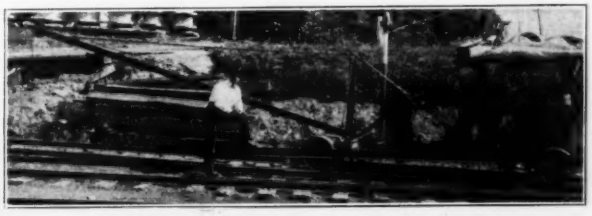
BY E. D. SWIFT
Assistant Engineer, Belt Railway of Chicago

IT is often necessary in track work to join a new or full section rail with a rail of the same pattern that has been reduced in height by wear. If, as is the usual custom, no provision is made to adjust the two heights of rail to a uniform surface, a step or abrupt change in surface is established that causes excessive deterioration. Not only are the ends of the rails battered, but the shock of wheels passing from one elevation to the other sets up strains in the splice bars and bolts that make the proper maintenance of the joint impracticable. Furthermore, the shocks encountered by rolling equipment, particularly locomotives, in passing over such joints, must be very detrimental.

As a means of eliminating such undesirable joinings, step splices, readily converted from the standard splice bars, have been used with much success by the Belt Railway of Chicago. A pair of splice bars are bolted to two short pieces of rail of the different heights to be joined, and then brought to a sufficient heat for easy bending. With a plate of a thickness equal to the difference in heights under the base of the low rail, and close up to the joint, the joint is put under a power hammer, or press, head up, and the desired offset put in the splice bars by forcing the high rail to an even surface with the low one.

A POWER-OPERATED RAIL-LAYING CAR

THE Chicago, Burlington & Quincy has recently built at its Aurora, Ill., shops, and is now using a power-operated rail-laying car for the handling of rails in relaying operations. The car consists of a steel frame supporting a platform 12 ft. long with a boom 18 ft. long extending out in front. This boom, which is built of 4-in. channels placed back to back, carries a ½-in. cable over an 8-in. wheel at the forward end of the boom with



THE RAIL-LAYING CAR

a rail clamp at the end of the cable. The boom is supported by a connecting rod to the vertical post at its rear end, which is in turn anchored to the platform of the car by 4 rods. The cable itself passes over the wheel at the forward end of the boom to a drum mounted on the platform of the car, which drum is operated by a 30-hp. Buda gasoline engine mounted near the rear of the car. A seat is provided on the car for an operator who controls the operation of the drum and the cable by means of a hand lever and a foot brake. The car is employed in

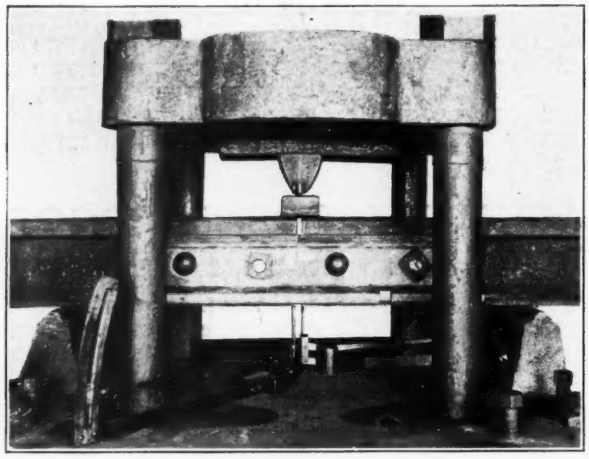
lifting the new rail from the shoulder of the embankment and lowering it into place on the ties. In addition to the operator one tong man is required to place the tongs on the rail and two men (one at each end) guide it into position. As soon as the rail is placed, the car, which is self-propelled, is run onto the new rail and the operation repeated. Other men follow behind, bolting and spiking the rail into place. The center of the rail is marked in advance and it is picked up by the clamp about 6 in. back of the center in order to raise the front end and lower the rear end to facilitate "heeling it in." While in the air the tong man strikes the rail with a steel bar to knock off any dirt and rust which may have collected on the base. The drum on which the cable is wound is provided with hand levers for use in case of an engine failure. Heavy rails are also placed on outriggers at the sides to counter-balance the car when picking a rail up from the shoulder.

The car is self-propelled and is capable of running at a speed of 10 miles per hour on the main line. When at work on a main track it is run onto the nearest siding under its own power to clear trains. Its purpose is to replace the tong men when relaying rail. In a recent performance 216 100-lb. rails were laid between one o'clock and 4:30 with a gang of 48 men. It has been found possible to lay a maximum of 100 rails per hour if there is a sufficiently large gang present to keep up with the bolting and spiking. The car is provided with a shelter for the protection of the operator, the canvas sides of which can be dropped to protect the engine from the weather.

Tests of Rail Joints*

BY H. B. MACFARLAND
Engineer of Tests, Atchison, Topeka & Santa Fe, Chicago, Ill.

THE object of the test was to study the effects on the strength and rigidity of rail joints, resulting from the following conditions: (1) The effect of various percentages of carbon on the physical properties of untreated angle bars, as compared with bars of similar composition and section that had been quenched; (2)



THE TESTING MACHINE

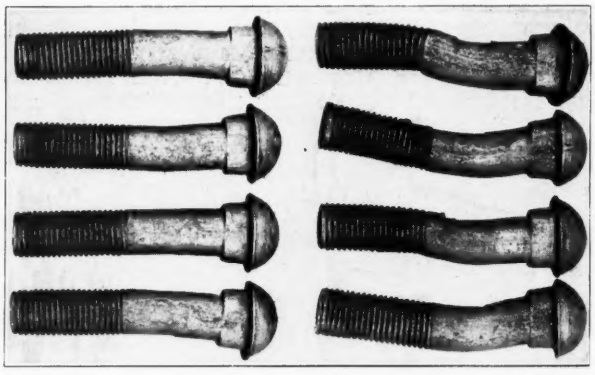
the influence on the strength of the joint, resulting from the use of oil quenched, medium carbon steel track bolts as compared with the untreated, low carbon steel track bolts.

Forty-eight pairs of bars were received for this test, 42 of which were Santa Fe experimental angles of different carbon range, and six were Illinois Central medium carbon, quenched bars. The Santa Fe bars were manufactured by the Colorado Fuel & Iron Company, Pueblo, Colo., for use with 90-lb. Santa Fe section rails. Six pairs of bars from each of the seven heats were used for test. The remaining bars were applied in service under various conditions. These bars were fitted with both untreated, low carbon steel track bolts and oil quenched, medium carbon steel track bolts manufactured by the Illinois Steel Company at Joliet, Ill. These bolts were 4¾ in. long under the head; from ⅞-in. stock; with rolled threads, measuring 15-16-in. in diameter over the threads.

The Illinois Central joint bars were manufactured by the Cambria Steel Company for 90-lb. A. R. A. type A rails. Six pairs of these quenched, medium carbon steel bars complete with bolts and lock washers were furnished for test. These bars were fitted with oil-quenched, medium carbon steel track bolts, manufactured by the Illinois Steel Company at Joliet, Ill. The bolts were 5¼ in. long under the head, from 15/16-in. stock, with hot rolled threads measuring one inch in diameter over the threads.

Thirty-eight pairs of these bars were subjected to either static or dynamic tests, the remainder being held in reserve for special investigation.

For static tests the angle bars were bolted to two 90-lb. Fanta Fe rail sections, about three feet long, which were supported by heavy knife edges set 30 in. apart on the bed of the 200,000-lb. Olsen testing machine. The



MEDIUM CARBON OIL-QUENCHED BOLTS — LOW CARBON UNTREATED BOLTS

load was applied at the center of the bars by means of another knife edge and a suitable block to simulate wheel pressure. The bars were bolted together so as to allow ⅜ in. between the rail ends, the bolts being stressed to approximately 20,000 lb. load in applying.

For the drop tests the bars for these tests were bolted to 90-lb. Santa Fe rail sections as in the static tests. The joint was placed on the supports of an M. C. B. drop

*Abstracted from a paper in Bulletin No. 188 of the American Railway Engineering Association.

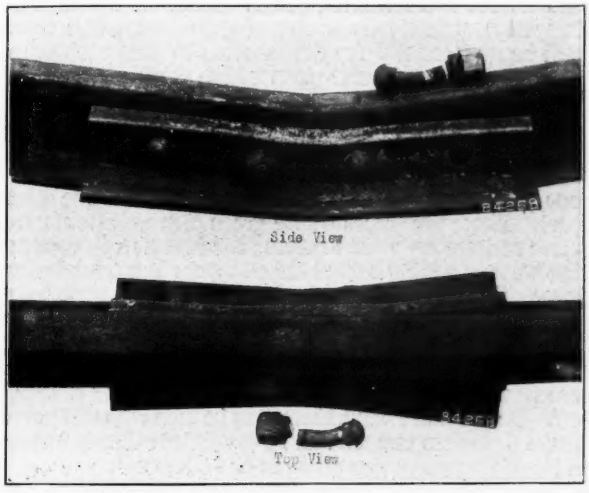
test machine using a 36-in. span. A 2,000-lb. tup was used with a fall of 8 ft. 6 in., which is one-half the height required by American Railway Engineering Association specifications for a 90-lb. rail.

The bars were given a succession of drops on the head or base until failure resulted. The bars were deflected on the first drop to an extent that the rail ends were usually together at the top and slightly over an inch apart at the bottom. After the rails had been deflected so that the ends came together at the top, the bars would tend to shear the bolts on being deflected further.

The greatest distortion of the bars at the center also occurred on the first drop after which the distortion per drop became less. The ends of the bars tended to spread out from the rail, as shown in one of the accompanying photographs.

The bolts in this test were under a stress which tended to shear and stretch them. The amount that the bolt was bent out of line, due to shearing for each drop, was not determined, but the elongation was measured. It was observed that in some cases the bolts were badly bent out of line, but did not show any great elongation.

Some of the bolts in these tests did not elongate in the first drop and in some cases they did not elongate in the second drop. The two center bolts showed a greater elongation than the two outside bolts. The slip of the bar on the rail was less in the case of loading on the base than of loading on the head of the rail.



One of the Joints After the Test

In drop tests the low carbon steel bolts were elongated more than the oil-quenched bolts for the same number of drops. The deflection of the bars was less in three of the four cases where the oil-quenched bolts were used than for the low carbon steel bolts.

The amount the bolts were bent in this test was indicated by the amount of slip of the bar on the rail. This slip showed that the oil-quenched bolts were not bent as much as the untreated, low carbon steel bolts, which is shown in an accompanying photograph. The bars were distorted more in every case for the untreated low carbon steel bolts than for the oil-quenched bolts. The data showed that the deflection and distortion of the bars in the drop tests were dependent on the elongation and rigidity of the bolts.

For the low carbon steel bolts three of the four joints failed by shearing the bolts, all failing on the third drop. For the oil-quenched bolts two of the four joints failed by shearing the bolts. These two joints each failed on the fourth drop. These data show that the oil-quenched bolts offer greater resistance to shear than the untreated low carbon steel bolts.

From a study of the data obtained in these tests, as shown by the curves and the comparative tables, the following facts are evident:

1. The strength and rigidity of the track joint are dependent on the strength of the joint bar.
2. The strength of material varies with the carbon content when other elements are constant, and the material is handled in the same manner regarding heat treatment and quenching.
3. Proper quenching of the material raises both the yield point and the ultimate strength of the steel, and results in a stronger joint.
4. The strength and rigidity of the joint are influenced to a slight extent by the strength of the bolt, both in static and dynamic tests, showing in favor of the oil-quenched, medium carbon steel bolt over the untreated, low carbon steel bolt.

UNNECESSARY INJURIES TO TRACK MEN*

By Isaiah Hale
Commissioner of Safety, Atchison, Topeka & Santa Fe

JUDGING from the way reports are coming in, this summer is to be an "open season" for personal injuries to track employees. It is inconceivable how or why some men do the things they do or how or why some foremen will permit them to be done. Very few of these injuries came from doing an unnecessary and dangerous thing the *first* time. If the foremen would eliminate these uncalled for and unjustifiable acts *the first time* they are tried many accidents and injuries would probably not occur. If you don't believe this is true, how do you explain the fact that there are scores of foremen on this system who have been here for from 10 to 30 years and never yet have had one of their men seriously injured?

Don't delude yourself into thinking that "luck" will follow a man hour after hour, day after day, year after year, and never desert him. There's more than luck; there's interest in his work; there's supervision that *is* supervision.

Another railway system makes frequent use of the expression: "The average accident might be prevented in less time than it takes to make a written report of it," and with much less embarrassment.

Get it out of your mind that the safety advice and warnings turned in your direction from time to time are not intended for you, but are meant for someone else. The one thing which, more than another, has contributed to the disappointing showing in our safety work is the fact that practically every man thinks *he* is immune from personal injury, and generally the first man to get hurt is the one who is so sure of his ability to take care of himself that he does not regard it necessary for *him* to remember that "Eternal vigilance is the price of safety."

The pipe crossbar handle on a certain handcar was loose, due to a nut being off the bolt. When the car was running too fast the handle slipped off the rocker frame and one man fell under the car and was run over. (The foreman who does not give his equipment close enough supervision to detect a defect like this, or, knowing it, does not make it safe, is contributing to an accident that will probably follow.)

A section man was injured when a lining bar fell off the motor car, one end striking the ground and the other

*From the Santa Fe Magazine for July.

end flying up and striking the man on the leg. (It was pretty thoroughly proven that the injury was due to the improper placing of tools on the motor car.)

A trackman was stooping to put on angle bars. Another man, spiking a tie or two away, struck a glancing blow and the spike flew out and struck the first man on the head. (A little care in such cases would prevent similar accidents.)

A section man stood too close to the track and was struck on the head by a chunk of coal that fell from a passing train. (During last summer every section foreman and every section laborer on the system was warned of the danger of standing too close to passing trains. It was the foreman's duty to see that his men got back a safe distance.)

A trackman was tightening bolts when his wrench slipped, causing him to fall backward and injure his spine. (No man ever should throw his weight against a track wrench without "setting" himself so that if the wrench does slip off the nut, he can save himself.)

Two handcars loaded with section laborers were coming in at night, the foreman in charge of the head car and the assistant foreman in charge of the second car. Entirely ignoring his instructions to keep moving handcars a certain distance apart, the assistant foreman ran his car so close to the head car that, when the latter stopped, the hind car crashed into it, killing one man and injuring others. (Our rules are very plain on this point, and, if lived up to, there should be no handcar accidents of this kind. The time to break up the practice of running cars too close together and too fast is before, not after, an accident happens.)

ELEMENTS OF GANG ORGANIZATION

By KENNETH L. VAN AUKEN

MUCH has been written and said on the subject of gang organization, but very little has been printed defining exactly what is meant by this term. If the men are working promiscuously here and there, and the work is conducted in such a way that parts of it are skipped as the gang goes along, the gang cannot be said to be organized.

Gang organization consists of five distinct steps: (1) Assigning each man definitely to a particular kind of work; (2) arranging the men in twos, threes, fours, fives or sixes, or the number required for a particular part of the work; (3) placing all the men in the gang in proper positions relative to each other; (4) picking out for each place the man best adapted to that particular work; (5) teaching and developing inexperienced men; (6) experimenting to find where fewer men can be used on any part of the work without decreasing the amount done.

It is not enough for the foreman to tell his men to "get tools for putting in a switch," or to assign his men to the work of putting in a switch, in the same manner. Each man should be designated as a spiker or a bolter, etc., so that he will be sure to understand exactly what he is to do.

Even if only three men are required for a piece of work, there is a chance to organize them by pairing off the two men who will work best together and using the third to assist them. The three men working separately might accomplish very little, but working together they can accomplish much. For instance, in spiking, two spikers should be paired off and a nipper assigned to them. Just enough men should be assigned to each part of the work to enable them to keep up with the rest of the gang.

Many trackmen prefer to have both spikers right-handed men, but the spikers themselves like to pair off a right-handed man with a left-handed man, so that both of them will walk and face forward. With good spikers, and a proper supervision to insure that the men do not move the ties when spiking them, there is no objection to pairing off a right-hand with a left-hand spiker, and they are likely to go along faster and be better satisfied. Another example which might be given to show the necessity for having the right number of men at each part of the work is in raising track with a large gang. The crew for each jack should consist of one man placing the jack blocks in the holes ahead of the jack men, two jack men, two tampers and at least one "swamper." If the men are not arranged in this or a similar way which is equally efficient, the work of the entire gang is likely to be held up.

Placing the gang so that all the men are at their proper places implies that each subdivision can just handle its work and keep ahead of the other parts of the gang, that the work is done systematically and that it is completed without the necessity for part of the gang running back to finish up. For instance, in arranging the end tampers in surfacing with three gangs on each side of the track: the head gang of tampers on each side should tamp every third tie, leaving the remaining two ties for the two following gangs. The ends will then be tamped completely as the gang goes along, and there will be no necessity for the laborers to pass each other in doing their particular parts of the work, nor for any laborers to go back to tamp ties which have been skipped.

In picking out for each place the man adapted to that particular work, the man's experience and his natural bent should be considered. A man who is worthless at one part of the work may be well adapted to some other part. There are places where green men may be started more satisfactorily than others; for instance, in tightening bolts or bolting behind the strappers in a track-laying gang. The work required of these men is not difficult, and it can be handled very well by almost any laborer who is trying to do what is right. In a surfacing gang there may be men who make good tampers, and yet who are poor at handling a shovel for filling in and dressing off. On the other hand, there may be men who will never make first-class tampers, and yet who are able to handle a lot of material when filling in and dressing up.

In teaching and developing new men, two methods may be followed: The foreman may taken hold of the tool to show a man exactly how to do the work, or he may pair off the green men with the experienced men and have the experienced men teach the others. When teaching the men by means of example, the foreman should perform each operation exactly, exaggerating the motions and making them very slowly. It is necessary to do a good deal of teaching in almost any gang to fill the places when experienced men leave the job. Frequently by pairing off a green man with an experienced man almost as much work can be done as if two experienced men were available.

There is often a chance to cut down the number of men in a particular part of a gang because the number originally provided is such that the men are not working to capacity. By taking some of the men from that particular work and assigning them to other squads the total output may be increased. There is also a chance to cut down some parts of the gang temporarily where conditions make their work lighter and transfer them to other duties.

When it is considered that a "poor gang well organized will do more and better work than a good gang poorly organized," the importance of these fundamental principles is realized.

THE BRIDGE AND BUILDING CONVENTION

A Resume of the Twenty-sixth Annual Meeting Held Last Week in New Orleans with Abstracts of Reports

The Dinner on Wednesday Evening.

THE twenty-sixth annual convention of the American Railway Bridge and Building Association was held at the Grunewald Hotel, New Orleans, La., on October 17 to 19. It was one of the largest in point of attendance in the history of the association, over 160 members registering. With members of their families and supply men, the total attendance exceeded 375.

A feature contributing to the large attendance was the operation of a special train consisting of seven sleeping cars, an observation sleeping car, two dining cars and a club car from Chicago to New Orleans by the Illinois Central and the Yazoo & Mississippi Valley. This train left Chicago on Sunday morning, stopped four hours at Vicksburg, Miss., to enable the party to visit the National Park, and reached New Orleans at 7 o'clock Monday evening. Approximately 200 people came on this train.

The officers for the past year were: president, Geo. W. Rear, general bridge inspector, Southern Pacific, San Francisco, Cal.; first vice-president, C. E. Smith, consulting engineer, St. Louis, Mo.; second vice-president, E. B. Ashby, chief engineer, Lehigh Valley, New York City; third vice-president, S. C. Tanner, master carpenter, Baltimore & Ohio, Baltimore, Md.; fourth vice-president, Lee Jutton, division engineer, Chicago & Northwestern, Madison, Wis.; secretary-treasurer, C. A. Lichty, purchasing department, Chicago & Northwestern, Chicago, Ill.

The convention was called to order by President Rear at 10 o'clock Tuesday morning and was opened with prayer by C. A. Lichty. In the absence of Mayor Behrman, City Commissioner Newman welcomed the Association to the city on behalf of the public, while L. A. Downs, general superintendent of the Illinois Central at New Orleans, welcomed it on behalf of the railways. C. E. Smith replied to these addresses of welcome on behalf of the association.

In his annual address, President Rear referred to the great development which has taken place in bridge work during the quarter century the association has existed. He also referred to the growing chasm between the railways and some of their organized employes and to the contrast between the attitudes of these men and the employees of the bridge and building department.

The report of the secretary-treasurer showed a balance of $1,403.47 in the treasury. During the past year 58 new members were received.

Eight committee reports were presented and discussed, abstracts of which follow:

A—INTAKES AND INTAKE LINES

The purpose of an intake is to provide an uninterrupted supply of water to the pumps. Also, if properly designed and constructed, it should prevent debris or rubbish carried by the water from entering the intake or the suction pipe and interfering with the operation of the pumps.

In considering the matter carried in water as affecting the operation of pumps a division may be made into two general classes: that having a specific gravity greater than water, such as mud, sand, gravel and cinders; and that having a specific gravity less than water, such as fish, leaves, small sticks and twigs, and vegetable matter. Certain classes of cinders also come under this classification. The first class may usually be taken care of by settling basins of proper design, while those in the second class require a strainer. Any one or a combination of all the above troubles may be encountered, with slush ice, anchor ice and snow as important factors for trouble during the winter months in the northern states. An intake which will prevent trouble from one cause will probably be ineffectual with another. Rarely are two problems of this kind found to be alike, for, given the same quantity and character of debris or rubbish, the current velocity or direction of flow may exert different influences.

Where the bed of the stream and the bed load is composed of coarse sand and gravel with but little silt or mud a fine strainer such as a well screen may be buried in the stream with good results. Where silt, mud and fine sand are carried in the water it is necessary to provide the well or sump with two or more compart-

ments where the water may be brought to rest and the heavy matter allowed to settle.

Where the water is clear and there is but little debris a foot valve with a strainer will answer the purpose, always providing the foot valve is readily accessible and of ample area. The straining area of a foot valve should be at least three times the displacement of the pump and preferably more, as with insufficient straining area the velocity of the water through the strainer is increased, and the debris accumulates more rapidly.

On some intakes it is the practice to use screens of large area and varying mesh, according to the size of the matter in the water, placing these screens beyond the mouth of the intake pipe. Various arrangements of these screens are employed for removing the foreign matter from the water, but the method usually adopted is to have the screen so arranged that a clean one may be inserted behind the dirty one, so that the latter may be removed for cleaning. It is therefore very essential that screens be readily accessible, and they can not be used where the height of water varies greatly or other conditions prevent ready access to them.

Where no foot valve is used the end of the suction pipe is sometimes plugged and perforated for several feet, thus forming a strainer. This method permits turning the pressure back from the tank where a by-pass is provided and flushing out the strainer. This is not desirable, however, where there is much foreign matter in the water, as it interrupts the operation of the pumps and wastes a great deal of water.

GEO. W. REAR
President of the American Railway Bridge and Building Asociation.

Where the water is taken direct from the source of supply without any intake pump the "twin" or "multiple" strainer is undoubtedly more effective than any other type. As the name would imply, these strainers consist of two or more compartments, any one of which may be cut out of service and cleaned without shutting down the pump. A 10-in. strainer of this type has been in use in a railroad pumping station in Chicago, pumping from Lake Michigan for seven years. There have been times when this strainer has been cleaned at intervals of 20 min. for 10 hr. at a time without shutting down the pumps. This type of strainer is usually located in the pump house at a point near the pump for convenience, but it may be located anywhere in the suction line.

A common trouble with lake intakes and sometimes with northern rivers is the formation of anchor ice in needles and in thin flakes. This anchor ice usually forms in moving water, and is carried below the surface by currents where it adheres to the intake, forming a heavy mass that soon shuts out the water and is very difficult to remove. Steam jets are sometimes used to keep anchor ice away, but the most effective methods of guarding intakes from this defect is to either locate the intake in quiet water or to create a zone of quiet water by driving piling.

SUCTION LINES

While in common practice a suction lift of 24 to 26 ft. is sometimes possible, a pump should rarely be placed more than 20 ft. above the lowest water and wherever practical just as close to the water as possible. Suction pipes should be made as short and direct as possible, avoiding all unnecessary bends or elbows. The size of the suction pipe will be controlled to a large extent by the permissible loss of suction head. If the suction line is of any considerable length it will be necessary to increase the size of the pipe to cut down the velocity and reduce the friction loss. In any event a suction line longer than 50 ft. or with more than two elbows should be at least one size larger than called for by the maximum delivery of the pump. Long suction lines and those with high lifts should be provided with vacuum chambers to take up the irregularities of flow due to the action of the pump. Suction lines are subject to more or less vibration owing to the action of the pump and the importance of keeping such lines tight necessitates the use of threaded or flanged pipe, except in cases where excessive corrosion occurs. The pipe should be of first-class material, preferably of genuine wrought iron pipe. Many suction lines show conclusively upon examination that deterioration and decay often occur after only a few years' service. No definite prediction can be made of the life of a suction line, the rate of deterioration depending upon a number of special conditions.

B—FUELS FOR INTERNAL COMBUSTION ENGINES

Three distinct grades of engine-burning oil have been developed from the crude oil, which are designated as light, medium and heavy distillates. The following table gives the products of crude oil of interest in connection with oil engines:

Light distillates	Solar oil
Light benzine	Gas oil
Gasoline	Residues
Heavy benzine	Cylinder oil
Medium distillates	Engine oil
Kerosene	Pitch and asphalt

The light distillates in the above table are suitable for a gasoline engine and may be burned readily through a carburetor or mixing valve. Kerosene and distillates of 39 deg. Baume and over with a flash point of 230 deg. and under, and a burning point of 280 deg. and under may be burned readily in a gasoline engine equipped with a generator for preheating the oil before it enters the cylinder. The remaining distillates of 26 deg. Baume and over may be burned readily in the hot bulb type of oil engine. It may be mentioned that the specific gravity is of minor importance, but a certain limit of low specific gravity is necessary in order to get the oil through the spray and lift pumps.

The main points in purchasing fuel oil for internal combustion engines are as follows: There should be only a trace of earthy matter, such as dirt, etc., in the oil, and not more than one per cent of water. Of coke residue there should not be more than a trace, as any appreciable amount will cause trouble in the plugging of the cylinders. There should not be more than a trace of free carbon in the oil. The sulphur content should

not be more than 0.8 per cent, as a greater proportion may attack the cylinder walls and tend to cause pitting. The oil should contain no free ammonia, alkalies or mineral acids because of their pitting effect on the surfaces exposed to combustion. The oil should not contain more than 0.05 per cent of non-combustible mineral matter. A paraffin content of more than 15 per cent may cause trouble, as a large quantity of oxygen is necessary for complete combustion. The oil should contain not less than 10 per cent of hydrogen and should have a heating value of about 18,000 B. t. u. per pound. The tar content should not exceed 0.4 per cent. Oil containing creosote will cause incomplete combustion and gives trouble by coking.

C. E. Smith,
Vice-President.

In selecting a fuel for an engine its composition as affecting combustion is most important. For proper combustion the fuel should be mobile and volatile, clean and free from water, solid particles and grit. In general the specific gravtiy of an oil rises directly as the vapor density. The boiling point and the amount of air necessary for combustion vary inversely with the volatility, and the greater the volatility of the fuel the better the ignition and combustion. Petroleum benzines require approximately 40 volumes of air, whereas the heavy petroleum products require approximately 100 volumes of air for complete combustion.

In order to utilize the existing equipment many of the gasoline engines now in service have been converted to kerosene and distillate engines by the addition of attachments for pre-heating the oil to (or near) the flashing point before it enters the cylinder. These attachments consist of generators or mixing chambers wherein the oil is heated by the exhaust of the engine. They are made in various sizes and types, both for throttling and for hit-and-miss governors. With these attachments the engine is generally started on gasoline and is allowed to run on this fuel until the cylinder and generator are heated when the oil is cut in. On other types a retort is provided where the oil is converted into a vapor or gas by heating the retort with a blow torch. Either method requires from five to ten minutes to start an engine running on oil. Electric ignition is used as with gasoline engines. Very little carbon trouble is experienced with the use of these attachments and the lubrication required is about the same as with a gasoline engine.

The heavy-oil engine is a comparatively recent development and is being extensively used in railway water stations, as well as for other service The most popular engine of this type is the two-cycle oil engine constructed in units of 50 hp. and under using heavy oil as fuel. This type of engine is very often confused with high-compression engines operating on the Diesel principle or with the converted gasoline engines using kerosene and distillates through a carburetor or mixing valve.

Intelligent lubrication is essential to the proper operation of the oil engine. Improper lubrication contributes largely to oil-engine trouble. The high speeds and temperatures at which these engines work necessitates a continuous and skillful use of good oil. Engines of this type are liable to suffer from carbon trouble and resultant deterioration owing to the fact that an excess of oil injected into the cylinder breaks up into volatile compounds, such as the naphthas, heavy tar-like oils and free carbon. Overloading the engine also will cause carbon trouble. When an engine is working up to its maximum power a momentary overload will cause an excess of oil and the resultant accumulation of carbon owing to the fact that the oil engine is not flexible enough to adjust itself instantly to the varying loads as does a steam engine or pump.

Though the oil engine can not yet be considered as fully developed, it has passed the experimental stage, and while it is perhaps not as reliable under all conditions as a steam engine or pump, much of the prejudice against it is undoubtedly due to lack of experience in handling. With the present imperfect knowledge of what the engine is capable of doing and of which particular oils may be burned in it, one can not speak conclusively, but there is no doubt that the future of the engine is assured.

C. R. Knowles (I. C.), chairman; C. A. Lichty (C. & N. W.), J. Dupree (C. T. H. & S. E.), J. J. Murphy (S. P.).

Discussion.

That part of the report relative to suction lines created a large amount of discussion. A. Montzheimer (E. J. & E.) stated that he has secured the best results when he has lowered a pump to within 2 or 3 feet of the surface of the water; in some instances he has permitted the water to flow directly into a pump. C. R. Knowles stated that this is especially true with a worn pump. It is also more economical in maintenance and in cost of operation. A pump will also deliver more water as the suction head is decreased. G. W. Rear called attention to the fact that as the length of suction line and the lift are decreased, the troubles from leakage, etc., diminish.

S. C. Tanner,
Vice-President.

B. F. Pickering (B. & M.) described a 1,300-ft. suction line with an 8-ft. lift and an undulating grade line where he has encountered a large amount of trouble with air pockets at the high points. He has found no way to avoid these pockets.

James Dupree (C., T. H. & S. E.) urged the construction of suction lines of screwed pipes, as it is impossible to maintain a tight line wtih leaded joints. R. H. Reid (N. Y. C.) stated that the difficulty with air pockets arises largely from the fact that a certain amount of air is in the water, and that as the pressure decreases this air is released and collects at the high points.

L. D. Hadwen (C., M. & St. P.) called attention to some intakes supported by floats which have recently been constructed by the St. Paul in settling basins at Mobridge, S. D., where the water passes through small reservoirs to permit the sediment to be deposited. These floating intakes enable the water to be withdrawn from the upper part of the basin.

W. M. Clark (B. & O.) emphasized the necessity of

individual study and design for each local water station and described a number of installations which were entirely unsuited to conditions other than those for which they were designed.

In discussing the report on fuels for internal combustion engines, C. R. Knowles stated that conditions are changing so rapidly with reference to the oil supply that data which may be entirely correct today will probably be out of date tomorrow.. The entire subject is passing through a very rapid transformation, making it necessary for one to keep closely in touch with the more recent developments.

LEE JUTTON,
Vice-President.

ENGINE HOUSE, SHOP AND FREIGHT HOUSE FLOORS

ENGINE HOUSES

Plank floors were formerly in common use, but since timber has become scarce and the cheaper grades of such poor quality, it is not considered economical to use all-plank floors for the less important houses. In the middle western territory hard maple, which may yet be secured at a reasonable figure, is the best available material for a plank floor, but where a considerable amount of water is used for washing out engines, etc., the planking is liable to curl up or swell, which is decidedly objectionable. Unless the planks are not less than 3 or 4 in. in thickness the floors are easily damaged and require frequent repairs.

Cinders, because of their low cost and cheap maintenance, are almost universally used and make a good floor for small outlying engine houses. Such floors should be well crowned and kept well rolled and tamped, as they are liable to be carried away by the water released when washing out engines. An improvement over the ordinary cinder floor is to place upon a cinder bed a coating of about 5 in. of limestone screenings, tamped to a smooth surface. An ordinary cinder floor costs about $0.50 per sq. yd., while one with a top of screenings costs about $0.75 per sq. yd.

Where the first cost is limited and engines are housed mainly for protection from the weather, an economical floor can be constructed of wooden blocks sawed from second-hand pine or fir bridge timbers, such as ties, stringers, etc., and laid on end on a cinder cushion. Such floors are of low first cost and are easily kept in repair. Floors of this description are still in fairly good condition after 15 or 16 years of service with no repairs. The blocks should be of a uniform depth, but the other dimensions may vary. Round cedar blocks have not proven satisfactory. The cost of wooden-block floors, as above described, ranges from about $0.90 to $1.00 per sq. yd.

Concrete has been used quite extensively with varying success. A very acceptable floor is built with 6 in. of concrete with a 1-in. neat cement finish. This does not require the use of hardeners or water-proofing materials. The concrete is stopped a sufficient distance from the edge of the engine pit to admit placing a jacking plank and to permit access to the wall plates and rail plates when it becomes necessary to remove them.

Vitrified brick laid flat on a well-tamped gravel or puddled sand foundation 5 or 6 in. thick and with sand-filled joints can be laid at a cost of about $1.25 per sq. yd. Clay, loam and other such materials can be used for filling. The committee is of the opinion that a brick floor, laid on a concrete foundation and costing $2 to $2.25 or more per sq. yd., is not to be recommended because of the cost.

Creosoted wood blocks, with the grain vertical, laid on a 2-in. sand cushion on a well-puddled and rolled gravel bed with a 4-in. crown at the center, between tracks, have been extensively used and have given good satisfaction. Hot sand should be used to fill the joints. The blocks may vary from 4 in. by 3 in. to 4 in. by 6 in. in size. The depth of the blocks should be uniform and from 4 to 8 in., the greater depths naturally holding better surface. This type of floor costs from $1.25 to $2.50 per sq. yd., depending on the thickness and local conditions. The same kind of floor laid on a 6-in. concrete foundation asphalt filler will cost about $3.25 per sq. yd. This is an ideal engine-house floor, as it is not so liable to damage as one constructed of harder materials when subject to falling objects, and it is almost impervious to water.

An asphalt mastic top 1½ in. to 2 in. thick on a concrete base has been in use for some time, and, as far as the committee has been able to learn, has given very good results. Such a floor can be built for about the same cost as creosoted blocks on a concrete base, as above described.

MACHINE AND BOILER SHOPS

The materials commonly used for floors in machine and boiler shops, listed in the order of their longest use, are plank, concrete, brick, creosoted blocks and mastic. The price of all these floors runs about the same as in engine houses, except that a concrete floor should be laid heavier to jack on, and should be not less than 5 in., and preferably 7 in., thick and laid on a slag or gravel foundation with a 1-in. float. It is better if the float has a mixture of some first-class waterproofing compound to make it impervious to water. This type of floor costs about $2.50 per sq. yd. The concrete should be thoroughly troweled to a smooth, hard, even surface.

C. A. LICHTY
Secretary-Treasurer.

Asphalt mastic on a concrete base is an ideal shop or engine-room floor. In this case the concrete should not be less than 5 in. thick, with a slip of felt saturated in asphalt next to the concrete. The asphalt mastic should be from 1½ in. to 2 in. thick, and as hard as possible on account of the grease that is liable to drop on it in such buildings.

Some of the members of the committee are of the opinion that creosoted wood blocks, with the blocks 4 in. thick and with an asphalt filler on a concrete foundation, practically the same as recommended for engine houses, make a good floor and can be used in machine or boiler shops. The blocks should be rectangular in shape, of uniform length and free from any irregularities, so as to prevent unevenness, as the floor wears under constant,

heavy use. The committee has recommended asphalt filler entirely instead of other tar products, as the others soften under different degrees of temperature.

WAREHOUSE AND TRUCKING FLOORS

The committee has knowledge of an untreated wooden floor, made of 2-in. D. & M. maple laid on 3-in. pine subplanking on sand or gravel filling, that has been in use under heavy trucking for 19 years and is still good. This floor was subject to heavy freight trucking.

For certain classes of floors a concrete surface is good, as it costs $0.80 to $1 per sq. yd. less than a floor with a mastic top. However, there are several objections to this class of floor for trucking purposes, among which may be mentioned dampness, dusting and slipperyness resulting from frost or some foreign substance on the surface. Truckers object to them, as they are cold to the feet.

It is the opinion of the committee that the best trucking floor is made with a concrete base and an asphalt mastic surface from 1½ in. to 2 in. thick; this mastic to be well troweled, but not hard enough to destroy its elasticity. Particular care should be exercised in getting mastic of the consistency to withstand various changes in temperature. In the south the floors can be made very much harder than in the north. The mastic should not be so soft as to flow when subjected to the trucking load.

A new wood floor is being put on the market so constructed that the wearing surface is on the ends of 1½-in. by 3½-in. blocks 2 in. in depth, dovetailed onto a base of either 1-in. or 2-in. plank. This floor can be laid the same as other plank floors, with a wearing surface on the ends of the blocks.

Committee: D. Rounseville (C. & N. W.), Chairman; J. S. Robinson (C. & N. W.), G. A. Mitchell (G. T.), R. M. Bowman (L. E. & W.).

DISCUSSION

In presenting the report, Chairman Rounseville stated that all prices quoted in the report were taken from actual work and included the cost of placing the filling necessary to support the floors; therefore, they could not be applied directly to other work without a full knowledge of local conditions.

J. P. Wood (P. M.) disagreed with the recommendation of the committee advocating a 1-in. neat cement top on a roundhouse floor. He found that this surface scaled off under heavy service, and has secured better results by puddling the concrete well when placing it and then floating it thoroughly. L. D. Hadwen (C., M. & St. P.) has reinforced that part of the concrete floor adjacent to the pits which has to carry the jacking load in a roundhouse. This and other special details affect the unit cost to an important degree. Lee Jutton (C. & N. W.) stated that he has used brick in roundhouse floors with good results, finding this form of construction particularly applicable where there is a possibility of a floor being opened from time to time to repair underground piping, etc. He has found that a concrete floor wears rapidly at the expansion joints.

E. C. Morrison (S. P.) described a mastic top which he placed on a concrete foundation in six freight houses 800 ft. long by 60 ft. wide in San Francisco. While this type of floor cost 15 per cent more than wood, it has required no repairs in the two years it has been in service. W. M. Clark (B. & O.) advocated the use of creosoted wood blocks on a concrete base with a ½-in. sand cushion, having secured favorable service from this form of construction. He reported difficulty with maple floors rotting from below because of poor ventilation.

J. Spencer (G. T.) recently placed 2,000 sq. ft. of creosoted wood-block flooring in an erecting shop, the first 10 bays of which were laid on a gravel foundation with a 1-in. sand cushion and the remainder on cinders, well compacted. He found that the latter form of support gives the better service.

J. B. Sheldon (N. Y., N. H. & H.) reported difficulty with concrete floors disintegrating in freight-house service. C. H. Fake (M. R. & B. T.) has found that concrete floors will give good satisfaction in small freight houses where there is little trucking, but that they are not so satisfactory at larger stations. L. D. Hadwen (C., M. & St. P.) stated that concrete floors have been used in a number of freight houses on his road without any trouble.

J. Gratto (S. P.) placed an asphalt macadam top on an untreated plank deck on a wharf at San Pedro, California, about 12 years ago. This wharf is subjected to heavy cart trucking and a timber floor lasted only a short time. The asphalt top was applied at a cost of 9½ cents per sq. ft. and has given such good satisfaction that it is planned to add it on a large amount of other wharves.

A. S. Markley (C. & E. I.) stated that he has secured good results from roundhouse floors on a sand fill laid with brick, with the joints grouted where the floors had given trouble from settlement before being grouted.

HANDLING CREOSOTED TIMBER

Timber has been and will continue to be one of the principal materials of construction employed in the bridge and building department. In spite of the inroads which steel and concrete have made in recent years, there are many forms of construction for which timber is eminently superior to any other materials. Its principal handicap is its limited resistance to decay, and this has been overcome in large measure by the use of creosote oil, zinc chloride and other preservatives. The protection of timber afforded by these preservatives has introduced new problems for the bridge and building workmen, the importance of which is not fully realized.

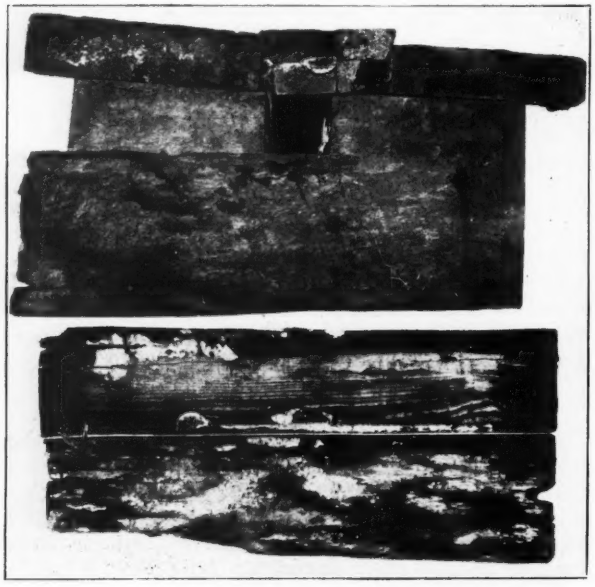
Only sound timber should be treated. Large quantities of timber have been treated in past years, and, to a lesser extent, are still being treated to-day, in which the decay is well advanced. It is only fair to state that this condition exists only because of the inability of those in charge of the timber-treating plants to detect such forms of decay rather than because of deliberate intent. It is only within the past few years that this condition has begun to be realized and many reported failures of creosoted timbers are not properly chargeable to the failure of the treatment, but are rather the result of the treating of timber which was entirely unsound before the preservative was injected. For this reason some of the railways have installed cut-off saws by means of which ½ in. of timber is sawed from the ends of each tie before it is treated, as a check on the inspection.

With sound timber properly seasoned the treatment should be sufficient to insure the complete penetration of all sapwood and some entrance into the heartwood. If the heartwood is entirely sealed with preservative there need be little fear of decay. In general, piling and bridge timber should be treated to refusal.

After going to the expense of treating timber it would appear to be self-evident that it should receive no unnecessary abuse that would tend to render the treatment ineffective. Yet largely as a result of ignorance and carelessness one sees treated timber handled with hooks and cut unnecessarily on nearly every railroad. If the character of construction is such as to warrant the use

of treated timber, precautions certainly should be taken to avoid all unnecessary penetration of the protective surface To gouge or tear this surface so as to expose the untreated timber, even at one minor point, may be sufficient to start decay within the stick and lead to early failure of the entire piece. Notwithstanding this, only two or three roads have prepared any instructions for the guidance of workmen handling treated timber.

The problem is primarily one of education. Few workmen are so minded that they will deliberately destroy



A TREATED TIMBER BOX WITH TWO UNTREATED PLANKS AT THE TOP WHICH FAILED AFTER FOUR YEARS' SERVICE.

the property of their employers if this can be avoided readily. If the injury resulting from the cutting of treated timber is pointed out to them and they are shown how to avoid this damage, most men will co-operate in eliminating this unnecessary destruction. Such measures, coupled with disciplinary action for the men who will not respond to educational measures, will eliminate a large part of the mutilation of treated timber found to-day.

The problem is not alone one for the men to solve, however. The timber must come to them in a condition requiring the minimum practicable amount of framing in the field. This has led to the framing of a large amount of timber before treatment, a practice which is receiving serious consideration on several roads to-day. At the Gautier, Miss., timber-treating plant of the Louisville & Nashville, which treats bridge timbers only, a carpenter shop has been installed at which all timbers are fully framed before they are treated. As a result the cutting of the timber after treatment is reduced to the minimum. Similarly on the Santa Fe, where large numbers of treated timber box drains and culverts are used, the timber is framed and sawed to the length desired before being treated.

Even with the most careful precautions it frequently becomes necessary to bore into timber or to cut it when using it in the field. The problem then is to protect it and to duplicate the original treatment as far as possible. It is the quite general practice to fill all bored holes with hot creosote and to apply coal tar, or, preferably, hot creosote to all cut surfaces. This treatment should be applied to all surfaces which have been cut, whether they show untreated wood or not. On one or two roads a coat of hot pitch is applied after the creosote as a seal. The importance of protecting all cut surfaces should be thoroughly impressed on the workmen.

Care should also be taken to avoid the use of treated and untreated material in the same structure. Instances are frequent where a workman runs short of treated material and thoughtlessly fills out with untreated timber, or applies a brush treatment to sufficient timber to complete the structure. The usual result of this action is to reduce the life of the adjoining treated timber, if not of the entire structure, almost to that of the untreated or partially treated timber by affording lodgment for the fungi in the unprotected wood, from which they spread to the adjoining treated sticks. This is forcibly illustrated by the accompanying photograph of a creosoted drain box, in which the center of the top was filled in with two untreated planks which supported a luxurious growth of fungi. To make matters worse, the treated timber had been sawed after treatment and these fungi came directly in contact with the untreated ends of the treated timber. It is not, therefore, surprising that this box failed after four years. This condtiion was only brought to light by the reported failure of the treated timber.

Piling requires special treatment, according to the conditions under which it is to be used. Where they are to be used in water infested with marine borers, special attention should be given to see that they do not contain pitch knots or other blemishes which will retard the penetration of the oil. Care must also be taken to see that the surface is not injured in handling.

For the same reason that it is advisable to apply a brush coat to all cut surfaces of stringers and framed timbers, pile heads should be protected after being cut off. The inconsistency of leaving the head of a pile unprotected after treating the stick carefully is so evident as to require no argument.

MISUSE OF TREATED TIMBER BASE.

The Atlantic Coast Line applies a paste of coal tar and lime to the exposed tops of piles handled by company forces, while the specification inserted in contracts for the building of structures by other than company forces reads as follows: "If untreated wood is exposed on any piece of creosoted timber or piling in framing, boring bolt holes, etc., the untreated part must be painted, when dry, with at least two coats of warm creosote. In addition, piling cut-offs must be covered with a paste of coal tar and lime." The Southern requires the heads of the piles to be coated with hot creosote, followed by an application of coal-tar pitch of such consistency that it will remain elastic at the lowest temperatures encountered.

In addition to the avoidance of all unnecessary cutting into treated timber, care should be taken in handling it to and from cars to avoid abrasions that would penetrate the treated surface. Heavy timbers should not be thrown from a car, as this tends to split and break them. Neither should they be handled with sharp-pointed grab-hooks or peavies. A number of roads use skids to transfer such timbers from pile to pile and to and from cars. Heavy slings are also used in place of

grab-hooks. While this may require some special attention at first, after such practices become standard and the men become accustomed to them, little, if any, additional time or exertion is required.

When stored along the line it should be piled solidly, so that it will not dry out too rapidly, and should be covered with a light layer of dirt for the same reason and as a protection from sparks from passing locomotives. All grass and other combustible materials should be kept cleared away from the piles. Piling intended for use in water infested with marine borers should not be piled in the sun for any length of time, as the oil evaporates and the resistance of the pile to the borers is decreased. In one instance treated piles left on the bank for two winters and one summer before driving were destroyed by marine borers in less than five years, while others of the same kind and treatment which were driven soon after being treated were attacked but slightly. This also probably explains the fact that the marine borers frequently attack one side of a pile more severely than the other.

Closely allied with the adoption of methods to secure full service from treated timber is the investigation of all failures to ascertain their cause in order that similar conditions may be avoided in the future. While the scientific investigation of these failures will in most cases be made by the engineer in charge of timber preservation for the system, he must depend on the local supervisors of bridges for notice of failures and for data regarding the service rendered and any conditions leading to failure. Too frequently treated timber which has failed to give satisfactory service is removed from a structure and destroyed without an examination being made to ascertain the cause. The result of a multiplication of such instances is a prejudice against all treated material and perhaps the discontinuance of its use. Treated timber has been used successfully too long to justify its condemnation because of any isolated failures, and the road which takes such action does so to its own detriment. On those roads on which no timber is destroyed until the reasons for its failure have been ascertained, the number of such failures reported has decreased very materially. It has been the experience that a very large proportion of those reported have been found to be due to other causes than the treatment, and in numerous instances the timber reported as treated timber was never treated at all. It is only by such investigations that the reasons leading to premature failures may be ascertained and the contributing conditions corrected.

E. T. Howson (*Railway Maintenance Engineer*), Chairman; J. S. Lemond (Sou.), F. D. Mattos (S. P.).

DISCUSSION

There was a difference of opinion regarding the extent to which the framing of timber before treatment is practical. C. R. Knowles (I. C.) uses creosoted timber in the supports for wooden water tanks, all of which is framed in advance at the treating plant. He has found that it is rarely necessary to bore a hole in the timber after it has been treated. J. Gratto (S. P.) reported a considerable amount of trouble with the failure of treated piles from interior decay. This was explained by other members as probably due to improper seasoning and the fact that the timber may have been unsound when treated.

MODERN METHODS OF DRIVING PILES

This report is confined to the consideration of methods of driving wooden piles. Track pile drivers are of two general types: turntable drivers and boom drivers. In some locomotive crane drivers these features are combined. Turntable drivers are in more common use, but the boom driver has a number of advantages.

In the early days of railroad pile driving drivers were frequently built in company shops. Today, there is less of this and machines are more commonly purchased from manufacturers. In general they are of standard all-steel construction and are equipped with air pumps and brakes for operation separately or as part of a train. They are self-propelled, power being supplied from the engines through shaft and gear connections to the car wheels. They can run at speeds of from 8 to 25 miles an hour and some can haul several cars. The turntable is turned or shifted and the leads raised and lowered by steam power under the control of the engineer. The leads may be battered in two or three directions, usually by hand-operated mechanism, and either a steam or a drop hammer may be used in them. Idlers are required at one end when moving these cars in trains.

There are many desirable features on these modern cars, but probably the self-propelling device is as valuable as any. With a car so equipped it is possible in many situations to dispense with the use of a locomotive. On busy lines it is usual to confine independent movement to short distances—say, one-half mile—and frequently short side tracks are laid near construction jobs to accommodate the driver. On light traffic lines, it would appear that the propeller might be used for greater distances. Use can be made of such a driver in material yards for shifting cars and the boom type of driver is especially valuable for this work.

Some drivers have a very long reach. One that will reach a second bent ahead is a great aid in emergency driving after a fire or washout. A wide side reach is valuable on three and four-track lines and for such use those drivers which have little overhang at the rear are advantageous.

The ability to operate the turntable mechanism and raise and lower the leads by hand as well as by power is a feature of some machines. A boom supported at the foot of the leads when raised, or on the hammer, is a handy contrivance for lifting bridge timbers, and electric lights for night driving are desirable. These have been applied by the Union Pacific to one of its drivers.

For driving piles in foundations beyond the reach of the track driver the most common practice is the use of the ordinary land or creeper driver, which consists of upright leads placed at the end of a pair of sills with a hoisting engine and boiler mounted on a platform at the opposite end of the same sills. In some cases power is furnished from a track driver and occasionally horse power is used. The driver is mounted on wheels or rollers, or hickory skids may be attached to the under side of the sills. The size of the machine varies with the nature of the work to be done and the weight of the hammer used is generally less than on track drivers.

Other methods employed for driving foundation piles are the suspension of leads from the boom of a track derrick, or of a stiff-leg or guy derrick placed on the ground or on barges; the extension of the leads of a track driver to reach the foundation pit; or leads may be suspended from the superstructure.

As with foundation piling the kind of equipment used for marine work depends on the nature of the work and the number and length of the piles to be driven. For heavy work fixed leads mounted on barges of from about 20 ft. by 50 ft. to 30 ft. by 60 ft. in plan, and 5 or 6 ft. deep are used. The engine, boiler and housing are located on the barge to properly balance the leads and hammer. Power winches should be provided to hold the barge in proper position. If battered piles are to be

driven the leads may be suspended near the top from a fixed A frame. Some roads use, in place of the fixed leads, a land driver similar to that described above mounted on a barge, and one of the Committee's correspondents expresses a preference for this type when it is not necessary to pull any piles.

For lighter work smaller barges which may be shipped on flat cars are convenient. Where conditions permit one may follow the practice of the Detroit & Mackinac and drive piles for docks and pier protection with a land driver resting on the ice.

Steam hammers are in use and are recommended for certain classes of work on 31 of the 52 lines answering the Committee's inquiry. A decided preference is shown for medium-weight steam hammers. It does not seem that there can be much difference of opinion about this. The heaviest hammers are more difficult to handle and when near the top of the leads increase the tendency of a driver to overturn. In addition, there are not many situations in railroad practice where a medium-weight hammer will not handle the work.

The minimum weight of drop hammers on track drivers is about 2,000 lb. In general, railroad companies are using hammers weighing from 2,800 lb. to 3,500 lb., although seven of the roads reporting to the Committee are using heavier hammers for some of their work, mention being made in one case of a hammer weighing 4,500 lb. As a rule heavier drop hammers are used on floating drivers of permanent construction than on track drivers, and lighter hammers are in use on land drivers.

The usual method of attaching a rope pile line to the pile is by means of a short piece of chain with a hook at the free end. When a wire cable is used as a pile line the chain is sometimes dispensed with, the hook being attached directly to the cable. Care should be used in placing and fastening the chain around the pile, particularly when handling freshly creosoted piles. The Boston & Albany uses a snatch block at the lower end of the lead, through which the pile line is passed when the piles are some distance from the track, thus preventing a side pull against the top of the leads.

Practice in regard to the assignment of drivers to divisions or to the whole line is not uniform. For the most part drivers are assigned to the whole line, although on some of the larger roads a driver is assigned to each division, but is moved to near-by divisions if there is occasion for it. In addition to the division drivers, there are sometimes additional drivers which are assigned to the whole line and used where there is a large amount of work, or on construction jobs.

Where drivers are assigned to divisions the pile driver crew is more or less permanent, but where assigned to the whole line the more common method is for the engineer only to accompany the driver. It is claimed by some that better driving results from this arrangement—presumably local pride has an effect.

The minimum depth of penetration for piles in trestles is usually considered to be about 15 ft., but there are numberless situations where piles stopped at this depth will not sustain the load. The determination of the proper stopping place is largely a matter of judgment and experience. Formulæ or rules have been devised to assist the judgment and a summary of the methods used by a number of railroad companies may be of interest:

Foreman's judgment without formulæ	14 roads
As long as the pile will drive without damage	6 roads
Practical refusal	13 roads
Engineering News formula	4 roads
Special instructions based on investigation and tests	3 roads

Records showing the total penetration are quite generally kept. Blank forms on which a variety of information is shown are used on many lines.

The water jet is in successful use under proper conditions on about 50 per cent of the railroads reporting. Some use it only with concrete piles, others for foundation piles or with a marine driver only. But one failure is reported and that is ascribed to the small size of the pump. Favorable conditions for the use of the jet are sandy soil, or gravel, and deep penetration. The practice is fairly uniform.

Jet pipes vary in size from 2½ in. to 1¼ in. and nozzles from no contraction on a 2-in. pipe to ½ in. at the end of a 1¼ in. pipe. On the Southern Pacific, the jet pipe is drawn out to a rectangular shape about ¼ in. by 2 or 2½ in. Some advantage is claimed for this shape when used in stiff material. Two jet pipes are occasionally used, as it is somewhat easier to guide a pile to correct position in this manner. The water pressure used varies from 100 lb. to 225 lb. per sq. in. and pumps with 3 or 4-in. discharge pipes are generally used. A large volume of water at moderate pressure gives the best results. Prof. Jacoby, in his book referred to previously, states that from 50 gal. to 250 gal. of water is required per min., but other authorities place the quantity at from 250 gal. to 500 gal. per min. A water jet may also be employed for loosening piles which are to be pulled.

A somewhat different type of jet wherein steam takes the place of water is in use on the Chicago, St. Paul, Minneapolis & Omaha and is described as follows: "We use a steam jet on a track driver when jetting is advisable and have found it practical and economical to bore the piles and insert the jet pipe so the full force of the jet is applied at the center of the point of the pile. A hole of proper size is bored in the center of the point and at an angle such that it comes out the side of the pile about two feet above the point. The nozzle of the jet is inserted in this hole and allowed to go down with the pile. This method has been used and found very satisfactory where it was desired to drive falsework piles down to rock to support two heavy spans while piers were being rebuilt."

In view of the large amount of attention given to the matter of safety during the last few years, an effort has been made to bring out descriptions of features which have been adopted for this reason and a list is presented herewith which it is believed will prove interesting and profitable. Some of the suggestions have already been adopted by practically everybody:

Rail clamps when driving on the side.

Cable guards to protect leads when driving on high elevations.

Steel pile cap.

Steam power for operating leads and car brakes.

Driver so constructed that no idler car is required when in a train.

Covering for all moving parts of machinery.

Stops for holding the hammer while a pile is being set in place.

Cables run along the main tension braces on a land driver and fastened to the main members to prevent the collapse of the frame in case of bolt failures.

Hand railing around the driver and tank at about the floor level.

The steam hammer.

Careful design.

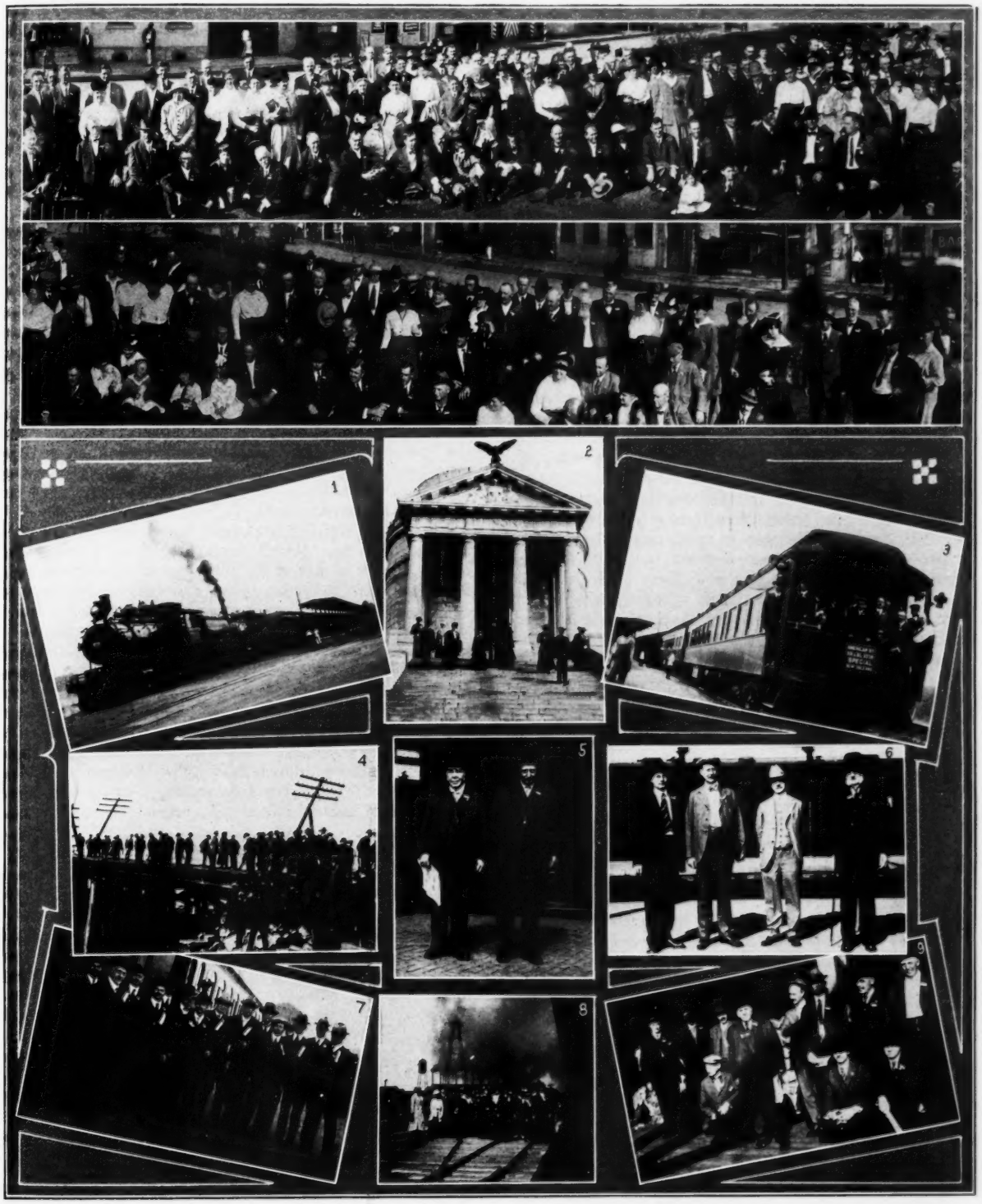
Competent men.

Careful inspection of lines and keeping the driver in good repair.

Provision for throwing the propelling mechanism in and out of gear from the side of the car.

Painting white the side of the hammer nearest the engineer so that he may readily see it.

The use of a blue lantern to signal the engineer when working at night to avoid confusion with train signals.



VIEWS IN AND ABOUT THE CONVENTION

Panoramic Photograph of the Convention Party at New Orleans: (1) The Special Train Leaving Vicksburg. (2) At the Illinois Monument in the National Cemetery, Vicksburg. (3) On the Observation Platform Leaving Vicksburg. (4) Examining the Creosoted Trestle Across Lake Pontchartrain on the N. O. & N. E. (5) Two of the Veteran Members. (6) On the Station Platform at Vicksburg. (7) Part of the Northwestern Men at Bogalusa. (8) Going Through the Sawmill of the Great Southern Lumber Company, Bogalusa, La. (9) An Early MorningInspection of One of the New Orleans Docks.

Special precautions to insure protection by flagmen as well as by train orders.

Metallic steam hose from the boiler to the hammer.

Foot boards on the front end.

Pile and hammer cables carried under the floor of the car; two extra running sheaves are required to accomplish this.

The Chesapeake & Ohio and the Western Maryland report piles driven by contract except in emergency cases. This, of course, is common practice in the case of foundation piles, but is somewhat unusual for trestle renewals.

Maro Johnson (I. C.), chairman; J. P. Canty (B. & M.), R. H. Reid (N. Y. C.), J. P. Wood (P. M.), O. F. Dalstrom (C. & N. W.).

DISCUSSION

Several members spoke of their difficulty in securing satisfactory service from the steam hose used with steam hammers, although A. S. Markley (C. & E. I.) stated that he had been able to drvie 3,500 lin. ft. of piling with one set of hose. E. K. Barrett (F. E. C.) and others reported difficulty with all types of hose which they had used. R. H. Reid (N. Y. C.) stated that he has used plain, armored and double-armored hose and has found that while the plain hose will not stand the abuse that the other types will, it will open up after being jammed, while the armored hose will not.

A. Montzheimer (E. J. & E.) urged the importance of the keeping of full penetration records of all piles driven because of their importance in valuation matters, not only as proof of the penetration secured, but also as a means of securing data regarding the wastage from the cut-off. A. S. Markley stated that such a record which he has kept since 1881 was consulted freely by the valuation department of his road when the government forces were making their inventory. G. W. Rear (S. P.) pointed out the fact that, within reasonable limits, it costs as much to drive a pile of one length as of another, and that for this reason unit costs prepared on the basis of the lineal feet of piling driven are misleading and of little real value.

L. D. Hadwen (C., M. & St. P.) referred to the increasingly common practice of using steel cables with drop hammers in place of manila rope. E. K. Barrett (F. E. C.) stated that he has used ¾-in. wire cable for this purpose for 15 years and that he has driven as many as 1,300 piles with one cable without a break. Wire cable costs less than rope. R. H. Reid (N. Y. C.) uses both manila and wire rope for both hammer and pile lines. He has found that the wire rope wears the sheaves faster than manila, but the latter is more flexible and more easily manipulated. He uses a 20-in. sheave at the top of the leaders and 18-in. sheaves at other points. B. F. Pickering (B. & M.) reported the use of four-strand lubricated manila rope, which lasts as long as wire cable and costs about the same.

While discussing the relative merits of steam and drop hammers, G. W. Rear stated that 50 per cent of the piles are overdriven and that a steam hammer will ordinarily secure all the penetration a pile requires, this conclusion being based on an observation of many broomed piles.

PASSENGER STATIONS OF MODERATE SIZE

Stations should be designed with simple, wide overhangings and with broad platforms, preferably on all sides of the structure. Attention should be given to the driveway approaches and paths, and, where there is sufficient ground, shrubbery should be planted that will be effective, not only through the growing season but through the winter months as well.

There is no set rule by which the size of a station suitable for any town or city may be determined. The revenue from ticket sales is an index of the passenger business originating at a station, but it might be misleading as to the kind of a station required, for some towns originate very little passenger business and yet are called upon to handle heavy traffic. The amount of transfer business must also be considered, and, where there is much of it, comfortable and commodious quarters must be provided. Many railroads have standard designs for the smaller stations, but these cannot be adhered to very closely because every location has different conditions that require modifications.

The station proper should have a general waiting room, and leading off from this a women's retiring room, with toilet, and also a men's smoking room and toilet. On the opposite side of the room there should be a ticket and telegraph office, and a baggage and express room. In addition to the ticket window there should be a window between the general waiting room and the baggage room so that passengers can check baggage without going out of the station.

With the maintenance cost in mind, the committee recommends the use of brick, stucco or concrete, because the first cost is very little higher than that of a frame structure. At some points stone costs about the same as brick. It makes a very good building material and gives a neat appearance. If brick is used it should be re-pressed or vitrified because a soft brick will result in a damp building. Rough texture bricks are being used extensively, and are more pleasing in appearance than smooth brick. In the matter of maintenance the painting of wooden buildings amounts to considerable. This is eliminated with brick, stone and concrete structures.

The roofs of stations require careful consideration. The plainer the roof lines are the cheaper is the upkeep, but appearance should not be sacrificed altogether for this item. The better buildings are roofed with tile or slate, and these materials should be used for slopes of 6 in. per ft. or over. Care should be exercised in securing the proper grades of materials. The best grade of slate is considered expensive, but for length of service it exceeds that of any other roofing material. The difference in price between a good and a poor quality of slate is not very great.

Several companies manufacturing roofing tile are willing to place it on a roof under a guarantee. While tile costs more than slate, the color adds a great deal to the appearance of the building. Ordinary sheathing paper is satisfactory under a slate roof, but a layer of composition roofing should be used under a tile roof. Composition roofs, asbestos shingles and tin are used to a limited extent, but they are not recommended for the better class of structures.

The interior of the station is usually of wood frame because it is cheaper and there is little danger of fire in a structure of this character. Brick or hollow tile makes a more substantial and fireproof interior, but the cost is not often justified. Walls are generally plastered and usually the lower five or six feet are covered with a wood wainscot in the waiting rooms, with tile in the toilet rooms. In many stations the walls are finished with a light-colored brick. This gives a finished surface that lightens the dark rooms and is very satisfactory from the standpoint of wear, but it is much more expensive than plaster.

One of the principal problems in a station is the floor surface. Wood holds and absorbs the dirt, while varnish is soon scratched and worn off by the cinders carried in by the passengers. Where wood is used it should be either maple or edge-grain pine. Composition floors are used extensively; they give a hard, impervious sur-

face, but their wearing qualities are not altogether satisfactory. Some tile floors have given good results, but others have worn badly, because the cinders are ground into them, causing the surface to craze and discolor. Floor tile should be vitrified to wear satisfactorily. Ticket offices should have wood floors, while vitrified brick floors give the best wearing surface for baggage rooms.

In the smaller stations, stoves are generally used for heating, but they are not to be recommended, except in very small stations. Hot water heating plants are more satisfactory than steam, but are recommended only where there is an attendant on duty for the full 24 hours. A low pressure steam plant is very satisfactory and is to be recommended where an attendant is not on duty the full 24 hours, as there is less likelihood of it freezing. There is practically no more danger than with a hot water system. Damper regulators are recommended for either hot water or low pressure steam heating systems.

Platforms should be not less than 10 ft. wide. In front of the station building they should be not less than 16 ft. wide and as much more as can be consistently allowed. Vitrified brick is quite generally used, but many roads prefer concrete. One feature in favor of a brick platform is that if settlement occurs or if any of the brick become broken they can be repaired more easily than if the platform is built of concrete.

DISCUSSION

R. H. Reid (N. Y. C.) emphasized the importance of improved lighting conditions in small stations. L. D. Hadwen (C., M. & St. P.) deprecated the use of timber floors in otherwise attractive stations, favoring some type of composition floor which, although requiring expert workmanship in laying, is more sanitary. E. C. Morrison (S. P.) stated that he has placed tile or concrete floors in small stations whenever it has been necessary to remove timber floors, preferring tile floors.

In reply to a question, J. S. Robinson (C. & N. W.) stated that he has used asbestos and asphalt shingles with satisfactory results, but that he has found that the asbestos shingles discolor more, particularly from the drip from wires crossing overhead. He has also found that it is difficult to keep clean the concrete floors in small stations, which do not have janitor service unless they have been well-troweled when laid.

HANDLING CONCRETE ON SMALL JOBS

It was decided that only such work should be considered as did not exceed 200 cu. yd. in volume and which would not warrant the installation of a special plant. Replies to a circular letter asking for information regarding their practices were received from 41 different railroads, representing a total of 127,500 miles and covering practically all the different railroad conditions that would be encountered in North America.

A summary of the replies shows that 31 roads, representing a mileage of 100,280, handle their small concrete work with their own forces in general, while two roads, with 2,839 miles, handle such work exclusively by contract. Six roads with a mileage of 24,403 use both methods, being governed by the nature of the work, its volume and the convenience in handling, the question of labor supply playing an important part in the method used. On small jobs of this character, contractors are often not in a good position to compete, as the work is connected with operating features and has to be adjusted to suit them rather than to suit the convenience and economy of its conduct. The question of safety and the desire to have the company's own employees handle construction under operated tracks or in the yards and has an important influence in eliminating contract work in many instances.

In considering the relative economy of handling work of this character by contract or by company forces, the fact that the contract price does not cover all the incidentals in connection with the work should not be overlooked. Company work is often conducted at a disadvantage from the point of economy in order to facilitate the work of other departments and delays which company forces may experience would result on contract work in large bills of extras which do not appear in the contract price.

Of the replies received, 31 indicate that they are able to organize the work so as to admit of a regular program through the season, while 5 are unable to do so. Three handle work of this kind by means of regular floating gangs. In most cases a program is mapped out in the spring and forces are organized to cover the season's work, though it is sometimes necessary to organize to take care of individual jobs. A desirable way of taking care of such small jobs would be to have a crew organized under the district authority to take care of the work on each district or division where the volume makes this justifiable. Some roads keep a regular gang all the year handling this class of work and moving from one division to another. This method is used on the Chicago, Burlington & Quincy, floating gangs moving from one division to the other and cleaning up all work as they go. On the Chicago, Rock Island & Pacific, regular bridge gangs are used for small work.

No very complete lists of the tools considered essential for a small concrete outfit were given. The following, which is typical of an outfit on small work on the C., M. & St. P., may be taken as an example:

1 Concrete mixer
10 Wheelbarrows
1 Cant hook
50 ft. 1-in. water hose
1 Small track jack
1 Combination vise
1 Hand axe
1 Double-bit axe
1 Sheet pile pounder
1 Timber bar
1 Cross-cut saw
1 No. 4 sand screen
12 D. H. S. P. No. 2 shovels
6 pr. knee boots
1 D. H. spade
1 8-lb. sledge
1 16-lb. sledge
1 8-ft. straight edge
1 Grindstone and frame complete
4 Claw hammers
4 pr. carrying hooks
2 Heavy mortar hoes
2 7/8-in. bridge augers
3 Tubular lanterns
1 Single-bit axe
2 Water barrels
6 Heavy galv. water pails
1 Gaso. driven diaphragm pump
1 Pinch bar
2 Combination nail pullers
12 D. H. R. P. No. 2 shovels
1 Measuring box
1 Tool box
1 Steel broom
3 Common brooms
1 Stonemason trowel
1 16-ft. straight edge
1 Plasterer's trowel
2 pr. wire pliers
200 ft. of 1-in. line
6 Track chisels
2 12-in. monkey wrenches
2 18-in. pipe wrenches
1 set 8-in. double blocks for 1-in. line.

The outfit should be adjusted, as far as possible, to the character of work the crew will be called upon to do and the hauling of all excess equipment and surplus second-hand lumber, etc., from other jobs should be avoided. Nearly all roads favor the use of a small mixer in any concrete outfit. In most cases the carpenters are required to furnish their own tools, but it is economy to have a liberal supply of hammers, saws, etc., on hand in an outfit so that laborers can be pressed into service, sheeting up the forms, etc., when they would otherwise be waiting. For crews making frequent moves, a tool car will save much handling, as small amounts of cement and lumber can be carried along with the outfit and only such tools as are necessary for the job in hand need be unloaded.

The size of the mixer recommended shows consider-

able variation, evidently, larger work being considered in some instances in the replies. Only 6 prefer hand mixing for small work. Sixteen recommend mixers with from 6 to 9 cu. ft. capacity of the unmixed charge. This corresponds to a 1-sack batch mixer. Eight prefer a half-yard or 2-sack batch mixer and two use ¾-yd. machines.

The opinions as to the minimum sized job on which the use of a mixer is justifiable vary widely. Four roads recommend using some form of mixer for quantities as small as 5 cu. yd. Six would use one where the quantities are from not less than 10 to 30 yd., 5 set 50 yd. as the limit and 6 consider 100 yd. a minimum.

L. D. Hadwen (C., M. & St. P.), Chairman; J. W. Wood (P. M.), C. F. Green (S. P.), G. H. Stewart (B. R. & P.).

DISCUSSION

C. E. Smith described the former practice of the Missouri Pacific of contracting all concrete work, which practice he found unsatisfactory. When organizing to handle this work with company forces, gangs were assigned to the local divisions and the quality of the work was materially improved. After the organization had been perfected and the necessary equipment secured, it was found that the number of requests for the replacement of timber bridges with concrete construction increased very rapidly. Between 1910 and 1915, 25 miles of timber bridges similar to those which had previously been renewed in kind were replaced with concrete culverts and embankments. The installation of company work enabled unit prices to be reduced 25 per cent. Up to one year ago no concrete work had been contracted for the last four years.

SMALL COALING STATIONS

There are certain general features of small coaling stations which are objectionable and which should be given careful consideration before any particular type of plant is installed. Some types of small plants require a trestle immediately over the coaling track at such a height as to just clear a high car. This condition is dangerous and objectionable, especially if the coaling is done on the main line. If that part directly over the tracks is of steel, the maintenance will be high, for the metal will be eaten away rapidly by the gases from locomotive stacks. If the overhead structure is of wood there is danger from fire, and also the trouble from the wood decaying quickly on account of the moisture from the exhaust steam.

With a timber structure there are always heavy maintenance charges when it gets old. The fire risk must also be considered. It is a serious matter to lose a coaling station by fire, even though it is a small one, for, owing to the location and the number and character of the trains served, a small station may be just as important to the operation of a railroad as a larger one.

Air-hoist bucket plants are used on many western roads for small stations. The trackage necessary is not great and the maintenance of such a plant is not high when the small amount of coal used is considered. The frame supporting the hoist is usually built over the coaling track, but some of the railroads use an air hoist having a derrick which swings out over the coaling track and avoids placing an obstruction over the coaling track.

A number of stations on the Southern consist of a high platform built alongside the coaling track at the proper height to permit shoveling coal from the platform to the engine. Above this platform and farther back from the coaling track is an elevated trestle up which cars of coal are pushed on a 5 per cent grade, and from which the coal is dumped to the platform. The cost of such a coaling station naturally varies, depending upon the size of the platform and the amount of track necessary to serve the plant. The cost of operation is high on account of the large amount of labor required in moving the coal. The cost of maintenance is also fairly high.

The Union Pacific employs mechanical plants almost exclusively, even where the consumption is small. On the Chicago & Alton the gravity type of coal chute is used, where the cars are taken up a high trestle and the coal is dumped by gravity into bins, and thence by gravity on to the engine. This type is preferred for the larger stations, but this road is using mechanical plants at less important stations and where the space is restricted.

The Western Maryland uses a small coaling station in which the loaded cars are pushed up an inclined trestle to the proper height above the coaling track. The coal is dumped from cars about 8 or 10 ft. to the platform and is then shoveled into small narrow-gage cars. These cars are then pushed out over a locomotive standing on the coaling track and dumped. This is another type of plant where the topography must be favorable in order to get the cheapest installation. It has the objectionable feature of an obstruction over the main track. The operation is a little high, but the maintenance is about normal.

In the small coaling stations on the Santa Fe the coal cars are pushed up onto a trestle and the coal is shoveled into pockets alongside the trestle, from which it flows by gravity to the locomotives. On the Chicago & Northwestern the gravity-pocket and the air hoist-bucket types are used. The gravity-pocket type, used where the consumption is small, is the same as that employed on the Santa Fe. For the air-hoist-bucket type a derrick is erected, the coal is shoveled from cars onto a platform and then into one-half-ton buckets, and it is then delivered to the engine by means of the derrick, the coal being dumped by opening the bottom of the buckets. Air from the locomotive is used in operating the derrick while the engine is being coaled. The derrick is also equipped for hand operation for moving the buckets around while they are being filled. The operation of these plants is rather high on account of the labor needed; the maintenance, however, is low.

A coaling station where the consumption is small should be as inexpensive as possible, that is, it is preferable to have a plant in which the cost of operation may be high rather than an expensive plant on which the operation may be comparatively low. In deciding on the construction of a coaling station the interest on the investment must be considered, and this may more than offset the higher cost of operation of a cheaper plant. Another thing to be considered is that small plants are more liable to be moved than larger ones.

Mention has been made of the growing tendency to use locomotive cranes for coaling stations. However, the cranes now in use are large machines having a capacity of from 15 to 20 tons. These cranes cost from $6,000 to $8,000, and if they are used in connection with elevated bins they result in rather expensive coaling stations. One company has worked up a design for a small crane having a capacity of 4,000 lb. at a 20-ft. radius, which will cost about $3,000. The only thing necessary to equip a small coaling station in addition to this crane is 400 or 500 ft. of trackage. The labor for operating such a plant will not require more than two men, and it will undoubtedly prove to be economical both in operation and maintenance.

L. Jutton (C. & N. W.), Chairman; W. F. Strouse (B. & O.), J. H. Nuelle (N. Y. O. & W.), G. W. Kinney (L. A. & S. L.).

The report was accepted without discussion.

OTHER REPORTS

A comprehensive report on Paint and Its Application to Railway Structures was presented in abstract by C. E. Smith, chairman. This report reviewed the tests of paints made during recent years by the American Society for Testing Materials, and the reports on painting made to the American Railway Engineering Association two years ago. It closed with a statement of the results which have been secured from the coating of a large amount of steel work with the cement gun on the Kansas City Terminal.

A report of Efficient Methods of Handling Work and Men, presented by F. E. Weise (C., M. & St. P.), chairman, described the methods of handling five special problems economically. These have been described previously in the Maintenance of Way section of the Railway Age Gazette and the *Railway Maintenance Engineer.*

DR. VON SCHRENK'S TALK

At the session on Thursday morning Dr. Herman von Schrenk, consulting timber engineer, St. Louis, gave an instructive talk on timber, its uses in railway work, its failures, and precautions which may be taken to avoid them. After discussing briefly the prevalent waste of timber in this country, particularly when compared with European practices, he pointed out means of securing the most economical use of timber in those places for which it is particularly suited. He described the density rule for southern yellow pine, which is being adopted rapidly by the railways, and pointed out its advantages over previous standards. The principal part of his address was devoted to means of protecting timber from unnecessary exposure to the agents of decay and from improper handling. He pointed out those defects most commonly encountered, using lantern slides freely to show unfavorable conditions, as well as those more satisfactory. The sanitation of lumber yards was particularly emphasized, and the statement was made that one yard which has given the subject special attention recently has reduced its losses from an average of 5 to 10 per cent annually to practically nil.

SUBJECTS FOR COMMITTEE WORK

The following subjects were selected for investigation and report at the next convention:

1. Organization of the water service department. Economical delivery of water to locomotives.
2. The construction of shop buildings.
3. Erection of plate girder spans with the least interference with traffic.
4. Roof drainage of railway buildings.
5. Repairing and strengthening old masonry.
6. Hand-operated devices for lifting, pulling and hoisting.
7. Paint and its application to the exterior of railway buildings.
8. Fireproofing the roofs of railway buildings.
9. Blank forms for water service records.
10. Snow sheds (an individual paper).
11. Efficient methods of handling work and men.

BUSINESS SESSION

Following recent agitation by members of the American Railway Bridge and Building Association and the Maintenance of Way Master Painters' Association for the consolidation of the two organizations, the former association invited the Painters' association to consolidate with it. The latter association, however, declined the invitation, believing that the proper time for this consolidation has not yet arrived.

At the annual election of officers on Thursday morning, the following were selected: president, C. E. Smith, consulting engineer, St. Louis, Mo.; first vice-president, E. B. Ashby, chief engineer, Lehigh Valley, New York; second vice-president, S. C. Tanner, master carpenter, Baltimore & Ohio, Baltimore, Md.; third vice-president, Lee Jutton, division engineer, Chicago & Northwestern, Madison, Wis.; fourth vice-president, F. E. Weise, chief clerk to chief engineer, Chicago, Milwaukee & St. Paul, Chicago, Ill.; secretary-treasurer, C. A. Lichty, general inspector, purchasing department, Chicago & Northwestern, Chicago, Ill. D. C. Zook, master carpenter, Pennsylvania Lines, Ft. Wayne, Ind., was elected a member of the executive committee.

St. Paul was selected as the location for the next annual convention.

ENTERTAINMENT

A three-hour business session was held on Tuesday evening to permit the members and their families to take an automobile ride about New Orleans on Thursday afternoon. A number of the members made an inspection tour of the docks along the river front on the same afternoon. On Friday about 275 members and guests went to Bogalusa, La., on a special train provided by the New Orleans & Northeastern and the New Orleans Great Northern railways to visit the sawmill of the Great Southern Lumber Company. Stops were made en route at the north end of the New Orleans & Northeastern trestle across Lake Pontchartrain to enable the members to examine this structure, and at Slidell, La., to visit the plant of the Southern Creosoting Works.

The Bridge and Building Supply Men's Association gave a banquet to the members of the Bridge and Building Association and their families in the Grunewald hotel on Wednesday evening, about 350 being present. On Thursday evening the annual Association dinner was held in the same building.

THE SUPPLY ASSOCIATION

The Bridge and Building Supply Men's Association held an attractive exhibit in rooms adjoining the convention hall, 30 firms, with 69 representatives, taking part. This exhibit was the largest ever held, both in the number of firms participating and in the number of men present. The exhibits consisted largely of photographs and blue prints, literature and samples of products.

The officers of this association for the past year were: President, D. A. Bonitz, National Roofing Co., Tonawanda, N. Y.; vice-president, J. A. Nealley, Joseph Dixon Crucible Co., Jersey City, N. J.; treasurer, L. D. Mitchell, Detroit Graphite Co., Detroit, Mich.; secretary, P. C. Jacobs, H. W. Johns-Manville Co., Chicago, Ill.

The firms exhibiting, with the character of their exhibits and the names of their representatives, are given below:

American Hoist & Derrick Co., St. Paul, Minn. Illuminated transparent photographs of railway ditchers. Represented by F. J. Johnson and W. O. Washburn.

American Tar Products Co., Chicago, Ill. Represented by J. L. Spell.

American Valve & Meter Co., Cincinnati, Ohio. Catalogs of the Poage automatic water column. Represented by J. T. McGarry.

Barber Asphalt Paving Co., Chicago, Ill. Represented by Arthur T. Cavey and Robert M. Jordon.

The Barrett Co., New York. Built-up and prepared roofing materials, coal tar products, creosote oil, iron and steel paints and the Holt roof connection. Represented by E. J. Caldwell, C. F. Ames, S. Day, G. R. McVay, W. Wamsley and E. H. Poetter.

Chicago Bridge & Iron Works, Chicago, Ill. Photographs and catalogs of steel water tanks. Represented by M. J. Trees, H. C. Brown and H. B. Murphy.

Chicago Pneumatic Tool Co., Chicago, Ill. Pneumatic tools and hose couplings. Represented by C. E. Walker, J. N. Stebbins and J. W. Lowell.

Detroit Graphite Co., Detroit, Mich. Represented by L. D. Mitchell, J. L. Hogan and W. D. Waugh.

Joseph Dixon Crucible Co., Jersey City, N. J. Photographs and catalogs of graphite paints. Represented by H. A. Nealley and H. A. Van Derslice.

Fairbanks, Morse & Co., Chicago, Ill. Represented by A. A. Taylor, D. K. Lee, J. George Jones, L. D. Matthews, C. H. Wilson and U. C. Kalar.

Grip Nut Co., Chicago, Ill. Grip nuts. Represented by J. E. Weatherford.

H. W. Johns-Manville Co., New York. Asbestos roofing, insulating shingles, steam traps and fire extinguishers. Represented by P. C. Jacobs, J. H. Trent, L. E. Hassman and H. G. Newman.

The Lehon Co., Chicago, Ill. Roofing and insulating materials. Represented by Tom Lehon and D. B. Wright.

C. F. Massey Co., Chicago, Ill. Photographs, blue prints and catalogs of reinforced concrete culverts, pile trestles, portable houses, sewer pipe, etc. Represented by C. F. Massey, C. Gilman and H. E. Burns.

National Roofing Company, Tonawanda, N. Y. Security Wide-Weld asphalt roofing and Hydrolx waterproofing. Represented by D. A. Bonitz and B. A. Flanders.

Otley Paint Mfg. Co., Chicago, Ill. Samples of railway bridge steel, refrigerator, car and building paints. Represented by Benj. F. Otley and W. A. Otley.

Patent Vulcanite Roofing Co., Chicago, Ill. Samples of felt, asphalt and ornamental roofing and asphalt shingles. Represented by A. J. Van Page.

The Patterson-Sargent Co., St. Louis, Mo. Represented by Jos. K. Patterson and W. H. McBride.

Philip Carey Co., Cincinnati, Ohio. Represented by G. L. Cockrell and A. Donaldson.

Pyrene Mfg. Co., New York. Fire fighting appliances. Represented by F. P. Murphy and E. J. Putzel.

The O. & C. Co., New York. Derails and tie spacers. Represented by R. B. Quincy and J. V. Wescott.

The Shepherd Automatic Switch Co., Montgomery, Ala. Model of the Shepherd Automatic Switch. Represented by M. L. Shepherd.

Simmons-Boardman Publishing Co., New York. Copies of the *Railway Maintenance Engineer* and the Railway Age Gazette. Represented by F. T. Howson and F. H. Thompson.

T. W. Snow Construction Co., Chicago, Ill. Represented by T. W. Snow.

Southern Pine Association, New Orleans. Examples of the correct and incorrect treatment of ties and piling. Illustration of the U. S. Forest Service—density rules for yellow pine. Represented by J. C. Valadie and Dr. Herman von Schrenk.

Standard Asphalt & Rubber Co., Chicago, Ill. Photographs and catalogs of mineral rubber floors, asphalt, etc. Represented by C. V. Eades.

The Texas Company, New York. Ready-to-lay, overlap and built-up roofings, asphalt paints and waterproofing compounds. Represented by W. E. O'Neill, J. F. Ryan and G. Musson.

U. S. Wind Engine & Pump Co., Batavia, Ill. Catalogs of Mansfield and U. S. water columns and Curtis pumps. Represented by C. E. Ward.

At the annual election on Thursday morning the following officers were selected for the ensuing year: President, H. A. Nealley, Joseph Dixon Crucible Company, Jersey City, N. J.; vice-president, L. D. Mitchell, Detroit Graphite Company, Detroit, Mich.; treasurer, P. C. Jacobs, H. W. Johns-Manville Company, Chicago, Ill.; secretary, Tom Lehon, The Lehon Company, Chicago. Executive committee—C. E. Ward, U. S. Wind Engine & Pump Company, Batavia, Ill.; W. H. Pratt, Heath & Milligan Mfg. Company, Chicago, Ill.; M. J. Trees, Chicago Bridge & Iron Works, Chicago, Ill.; A. A. Taylor, Fairbanks, Morse & Co., Chicago; C. H. Cockrell, Philip Carey Company, Cincinnati; C. F. Massey, C. F. Massey Company, Chicago, Ill.

THE OLDEST EMPLOYEE.—The October number of the Maize, the Chicago Great Western employees' magazine, presented the photograph of John C. Brown, section foreman at Waterloo, Ia., as the oldest employee in continuous service on the road. Although Mr. Brown is only 47 years old, he has worked for the road 33 years.

CONVENTION OF MAINTENANCE OF WAY MASTER PAINTERS

THE thirteenth annual convention of the Maintenance of Way Master Painters' Association of the United States and Canada was held at the Hotel Walton, Philadelphia, October 17 to 19, inclusive, with an attendance of about 40 members, together with representatives of a number of paint manufacturers. The meetings showed a marked improvement over last year's convention, both as to the attendance and the scope of the program.

L. P. Nemzek (John Lucas & Company) presented a paper on "Preservative Coatings for Iron and Steel," in which he recommended and gave reasons for the advantages of basic lead chromate in place of the commonly used oxide, red lead. H. A. Gardner (Institute of Industrial Research) gave an illustrated lecture on "Physical Characteristics of Pigments and Paints," which included reference to the possibilities of kukin oil, the oil of the soya bean and perilla and china wood oils. Pigments were considered from the standpoint of hiding power, oil absorption, opaqueness, suspension, etc. He prefers red lead containing 15 per cent of litharge. In commenting on this, A. H. Sabin (National Lead Company) stated that this amount of litharge was an advantage in a paint to resist water because the film was necessarily thicker.

Three papers were presented which covered the subject of fire resisting properties of paint, one by W. A. Clapp (Clapp Fire Resisting Paint Company) on "Fire Resisting Paints," another by G. F. Johnston (Pyroline Products Company), entitled "Reducing Fire Losses," and a third by H. J. Barkley (I. C.) on the "Application of Fire Resisting Paints." In discussion of these papers, H. A. Gardner expressed the view that any good paint containing a mineral pigment has fire resisting properties, since after the oil is driven off by the heat the surface is covered with a coating of purely mineral substances. E. H. Brown (Painters' Magazine) stated that he had found a heavy coat of lime whitewash, when protected from the weather, to be a good resistant. A number of the members spoke of their experience with various formulæ containing whitewash as the principal ingredient.

W. S. Lacher (*Railway Maintenance Engineer*) presented a summary of the organization and administration methods as carried out on American railways in the repainting of bridges. M. F. Ebel (C. H. & D.) told of the precautions to be taken to safeguard the lives of men in railway painting. The position of the master painter in relation to his men and to the railroad was discussed at some length following an outline presented by H. E. Conrad (P. R. R.).

Papers were also presented on the following subjects: "What the Association Has Done for the Railroads," by A. B. Phelps (N. Y. C.); "The Influence of Pigments on Paint Permanency," by Malcolm McNaughton (Joseph Dixon Crucible Company); "Sanitary Value of Paints," by E. W. Lutes (Sherwin-Williams Company); "The Selection of Brushes," by A. G. Pruett (C. & O.), and "Benefit of the Association to the Railroads," by O. Stubstad.

All officers of the association were re-elected for the coming year and include F. C. Rieboldt, president (C., M. & St. P.), Milwaukee, Wis.; H. E. Conrad, first vice-president (P. R. R.), Huntington, Pa.; A. E. Wilson, second vice-president (N. Y. N. H. & H.), Hartford, Conn.; F. W. Hager, secretary-treasurer (Ft. W. & D.), Fort Worth, Texas. The next convention will be held at Cleveland, Ohio, on October 16 to 18, inclusive.

GENERAL NEWS DEPARTMENT

THE DEPARTMENT OF COMMERCE has issued a statement advising that the exports of railroad supplies from the United States for the seven months ending with July amounted to $36,215,000, as compared with $9,465,000 for the same period of the preceding year.

THE PUBLIC SERVICE COMMISSION OF PENNSYLVANIA has adopted a resolution fixing the fiscal year for reports made to the Commission to end December 31. All companies are notified, however, to file the usual annual report for the fiscal year ending June 30, 1916.

THE SUPREME COURT of the state of Washington holds that the driver of an automobile who drove up a 12 per cent incline to a crossing on intermediate gear at a speed of 10 to 15 miles an hour, under which circumstances the car could have been stopped in from 3 to 5 feet, but failed to stop though there was an approaching train in view not more than 300 ft. away, was negligent, as matter of law, in attempting to cross in front of the train.

THE CANADIAN GOVERNMENT officially announces that an arrangement has been made with regard to supplying rails required by the railways, which will temporarily satisfy their urgent requirements. Owing to the fact that the steel companies have latterly devoted their principal attention to the making of war munitions, there has arisen a great shortage of rails, the railways being unable to obtain those needed for track maintenance. The exact line of policy to be pursued in order to relieve the situation is not indicated, but it is understood that the customs duties on rails will be temporarily suspended.

THE FORESTY EXHIBIT to be shown at the International Soil Products Exposition, El Paso, Tex., while intended primarily for the farmers, contains features which will be of interest to maintenance of way men. The exhibit will contain actual working models of two types of post-treating plants suitable for use in treating fence posts and other timbers. The system of fire protection for the national forest will also be shown, by a miniature of a typical lookout tower, from which the forest guard watches for signs of fire, together with telephone lines and fire-fighting tools with which the fire-fighting force is provided.

THE LEHIGH VALLEY, inconvenienced by the scarcity of vessels available for the transportation of ties from the South, and the high rates charged, lately used in that traffic its own sea-going tug, "Perth Amboy," which ordinarily takes coal to New England. The tug was sent south with three steel barges used for carrying coal, these being placed at Brunswick, Ga., and Jacksonville, Fla., where ties are easily concentrated, and a load of 50,000 ties was quickly obtained. The tug experienced no difficulty in bringing the tow back to Perth Amboy (New York harbor) and the experiment is regarded as a complete success, as there was a large saving in the cost, and the company was able to bring a large quantity of ties to its line promptly.

J. M. DAVIS, OPERATING VICE-PRESIDENT of the Baltimore & Ohio, returning from a recent inspection trip over the eastern lines of the company, said, "If all the idle men who have no visible means of support were forced to go to work, there would be no shortage of labor in the United States. There is a very serious shortage of labor in the Pittsburgh district, but in a few hours' daylight ride through this section I counted over 100 able-bodied men beating their way on Baltimore & Ohio freight trains in both directions in and out of Pittsburgh. It is not only in connection with the present scarcity of labor that I am interested in the subject, but I have felt for some time that this question is inseparably linked with the trespassing problem."

THE TENTH ANNUAL CHICAGO CEMENT SHOW will be held in the Coliseum from Wednesday, February 7, to Thursday, February 17, 1917, inclusive. The exhibits will be concentrated this year in the Coliseum with the balcony and annex, without the First Regiment Armory, which was used last year. While this space will be devoted to the exhibit, it will be concentrated in a manner to make it more accessible to visitors. During the same week the National Builders' Supply Association will hold its annual convention at the Hotel Sherman, on February 11 and 12, while the Illinois Lumber and Builders' Supply Dealers' Association will meet at the same hotel on the two following days. It is also probable that the American Concrete Institute will meet at the same time.

THE BALTIMORE & OHIO has distributed to every employee whose duties are in any way hazardous a booklet, entitled "Safety and Sanitation Rules," embracing precautionary practices it has found necessary to enforce in conducting the operation of its trains, tracks and shops. Although the year 1915 showed an increase of 56 per cent for fatalities and 18 per cent for injuries in the reduction of accidents to employees over 1913, the railroad management expects to obtain further reductions in accidents through the influence of this booklet. The preface to this book consists of a letter from J. M. Davis, operating vice-president, who states that "Safety must be the first consideration of every department of the service and that compliance with the rules and the co-operation of each employee is imperative."

THE ILLINOIS CENTRAL and the Yazoo & Mississippi Valley, through the general manager, T. J. Foley, has issued an appeal to motorists to "Stop, look and listen" at highway crossings. According to Mr. Foley, during the ninety days preceding September 26, 18 persons were killed and 36 persons injured in automobile grade crossing accidents on the Illinois Central. Mr. Foley further states that statistics prove that crossings which are used extensively, and therefore are considered the most dangerous, are really the safest. The great majority of accidents occur at outlying crossings which are the least used. He calls attention to the fact that there are 8,000 grade crossings on the Illinois Central system and that to separate the grade at these crossings would cost $215,408,020, which is nearly twice as much as the capital stock of the company.

THE PENNSYLVANIA RAILROAD annual track inspection was made by S. C. Long, general manager, and a party of about 400 operating officers on October 3 and 4. This inspection covered the main lines between New York and Pittsburgh and between Philadelphia and Washington, and $5,400 in prizes were awarded to the supervisors and their assistants for excellence in track maintenance during the past year. The first, or "Klondyke" prize of $1,200, divided on the basis of $800 for the supervisor and $400 for the assistant, is an award for the best maintained subdivision throughout the year, and was presented to C. M. Wisman, supervisor, and H. M. Grimm, assistant supervisor, who have charge of the track from east of Liddonfield, Pa., to west of Plainsboro, N. J. Four prizes of $800 each, of which $600 was for the supervisor and $200 for the assistant, were awarded for the subdivisions having the best line and surface on each of four main-line divisions. These prizes went to C. Z. Moore, supervisor, and L. R. Fleming, assistant supervisor, in charge of track between Harrisburg and Dillerville; W. R. Hanly, supervisor, and B. M. Frymire, assistant supervisor, in charge of track from east of Thompsontown, Pa., to west of Marysville; W. E. Brown, supervisor, and G. H. Stewart, assistant supervisor, in charge of track between New Florence, Pa., and Donohoe; W. F. Rench, supervisor, and A. G. Andrew, assistant supervisor, in charge of track between Perryville, Md., and Back River bridge, north of Baltimore. A special "Improvement" prize of $1,000, $700 to the supervisor and $300 to the assistant, for the greatest improvement made in the line and surface of a supervisor's section of track was awarded to J. E. McIntyre, supervisor, and W. W. Portser, assistant supervisor, who have charge of the track from Anderson, Pa., to east of Thompsontown. These awards were made upon the basis of frequent inspections during the past year by a special committee, appointed for the year, composed of W. G. Coughlin, engineer of maintenance of way; A. B. Clark, assistant engineer of maintenance of way; L. W. Allibone, superintendent Sunbury division, and J. K. Johnston, superintendent, Tyrone division.

PERSONAL MENTION

GENERAL

CARL BUCHOLTZ, formerly division engineer of the Erie, and more recently trainmaster at Huntington, Ind., has been promoted to the position of assistant superintendent at Kent, Ohio.

H. G. SPARKS, division engineer of the Chicago & Eastern Illinois at Salem, Ill., has been appointed assistant superintendent of the Chicago division, with office at Brazil, Ind., succeeding S. S. Huffman, promoted.

L. W. BALDWIN, formerly engineer maintenance of way of the Illinois Central, and more recently general manager of the Central of Georgia, has been elected vice-president and general manager of the latter road, with headquarters at Savannah, Ga.

BENJAMIN N. HUDSON, general foreman of bridges and buildings of the Trinity & Brazos Valley, was appointed assistant superintendent, with office at Teague, Tex., effective October 1. He entered railway service with a company at Little Rock, Ark., which is now a part of the St. Louis, Iron Mountain & Southern, and for several years was employed with a bridge construction crew. About 1900 he became connected with the bridge and building department of the Texarkana & Ft. Smith, and when this company was taken over by the Kansas City Southern he held the position of general foreman of bridges and buildings. He was later appointed master carpenter of a Texas subsidiary of the Chicago, Rock Island & Pacific at Fort Worth, Tex., being appointed roadmaster of this same road in 1910 and transferred to Amarillo, Tex. In 1911 he went to the Trinity & Brazos Valley as general foreman of bridges and buildings.

ARTHUR B. CLARK, assistant engineer of maintenance of way of the Pennsylvania Railroad, in charge of roadway and track at Philadelphia, Pa., has been appointed superintendent of the Renovo division, with headquarters at Renova, Pa., succeeding J. M. James, deceased. Mr. Clark was born on October 1, 1867, at Green Village, Pa., and was educated at Mercersburg College, and in 1891 graduated from Lafayette College with the degree of C. E. He commenced work on the Pennsylvania Railroad in 1889 and advanced through the maintenance department. He was made assistant engineer of the Middle and Western divisions of the Philadelphia & Erie, on December 15, 1905, and was subsequently transferred in the same capacity to the West Jersey & Seashore, and later to the Maryland division of the Philadelphia, Baltimore & Washington. In January, 1910, he was appointed principal assistant engineer of the same road, with office at Wilmington, Del., and in June, 1913, he became assistant engineer of maintenance of way of the Pennsylvania Railroad, in charge of roadway and track, which position he held at the time of his recent appointment mentioned above.

ENGINEERING

A. W. WHITE, office engineer of the Chicago & Eastern Illinois, at Chicago, Ill., has been appointed division engineer with office at Salem, Ill., succeeding H. G. Sparks, promoted, as noted elsewhere.

WILLIAM A. DUFF, engineer of bridges on the Canadian Government Railways at Moncton, N. B., has been appointed assistant chief engineer, effective October 1, 1916. He will continue to perform the duties devolving upon the engineer of bridges, but will also have charge of the Halifax Ocean Terminals, and will perform such special work as may be assigned to him by the chief engineer.

IN CONNECTION WITH THE APPOINTMENT of T. H. Niemeyer, division engineer, Pittsburgh division of the Pennsylvania Railroad, to the position of assistant engineer of maintenance of way in charge of roadway and track, the following appointments and transfers have been made, which became effective September 27, 1916: J. B. Hutchinson, Jr., division engineer of the Monongahela division, was transferred to the Pittsburgh division, with headquarters at Pittsburgh; C. E. Brinser, division engineer at Williamsport, was transferred to the Monongahela division, with headquarters at Pittsburgh; A. W. McClellan, division engineer of the Trenton division, was transferred to Williamsport, and Elmer Irving, supervisor at Lancaster, Pa., was promoted to the position of division engineer of the Trenton division.

J. S. MCBRIDE, valuation engineer of the Chicago & Eastern Illinois, has been appointed principal assistant engineer, with office at Chicago, Ill. He will still perform the duties connected with his former office as valuation engineer, this latter office having been combined with that of his present position. He was born at Louisville, Ky., where he received his early education. Later he graduated in civil engineering from the Rose Polytechnic Institute. In 1905 he entered railway service with the Chicago & Eastern Illinois as instrument man on construction and maintenance, since which time he has been continuously in the employ of this company. In 1908 he was appointed assistant engineer on the Illinois division at Salem, Ill., and in 1914 was promoted to valuation engineer at Chicago, Ill., which position he held until his recent appointment as principal assistant engineer.

ELMER IRVING, supervisor on the Pennsylvania Railroad at Lancaster, Pa., who was promoted to division engineer of the Trenton division on September 28, with headquarters at Camden, N. J., as noted elsewhere, was born at Trenton, N. J., in April, 1878, and entered the services of the Pennsylvania Railroad as a rodman in the office of the assistant engineer in New York in June, 1895. Later he enrolled in Cooper Institute and graduated from that institution in 1900. In April, 1902, he was advanced to the position of transitman under the principal assistant engineer at Altoona, Pa. On January 1, 1903, he was promoted to the grade of assistant supervisor, with headquarters at Haddonfield, N. J. He was transferred to New Florence, Pa., in 1904 and to Osceola Mills in 1905. On December 1, 1908, he was promoted to the position of supervisor, with headquarters at Earnest, Pa., being transferred to Lancaster, Pa., in 1912, where he was located at the time of his recent appointment.

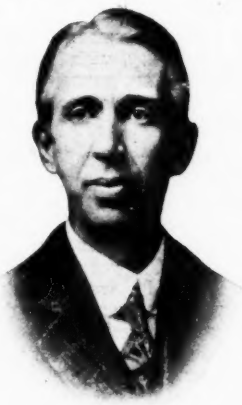
ELMER IRVING.

J. D. ELDER has been appointed division engineer of the Western division of the Michigan Central, with headquarters at Niles, Mich., succeeding C. C. Hill, transferred to the valuation department. John Evans, division engineer of the Detroit division, has been appointed division engineer of the Detroit Terminal and Toledo division, with headquarters at Detroit, and E. C. Wurzer has been appointed division engineer of the Detroit division, with headquarters at Detroit. These two latter changes follow the division of the Detroit division into the Detroit and the Detroit Terminal and Toledo divisions.

EDWARD C. WURZER, whose appointment as division engineer of the Michigan Central at Detroit is announced elsewhere in these columns, was born in April, 1880, at Detroit, Mich. After obtaining a preliminary education in his native city he entered the University of Notre Dame, leaving in 1903 to accept employment with the Michigan Central as rodman. He has been continuously in the service of this company since that time, being promoted to transit man in 1904 and to assistant engineer in the division engineer's office at Detroit, Mich., in 1906. In 1907 he was transferred to the bridge department as a draftsman and in 1909 he was promoted to bridge inspector. From June, 1912, to July, 1914, he was assistant engineer on construction on the connecting railroad and hump yard then being built at Detroit, Mich. From July 15, 1914, to September 1, 1914, he was acting division engineer, with office at Jackson, Mich., and from September 1, 1914, to October 1, 1916, he was assistant field engineer in the valuation department. His appointment as di-

vision engineer of the Detroit division became effective on October 1, 1916.

H. E. STEVENS, engineer of bridges on the Northern Pacific, with office in St. Paul, Minn., has been appointed chief engineer, succeeding W. L. Darling, resigned. Mr. Stevens was born March 8, 1874, at Bluehill, Maine. After attending the common and high schools of his native community, he entered the University of Maine, from which he graduated in 1897, after completing the engineering course. Immediately upon leaving the university he took up his engineering practice. About three years later he became associated with Ralph Modjeski of Chicago, Ill., with whom he remained up until the early part of 1904. In May of this year he entered the services of the Northern Pacific, being assigned to the bridge department. For three years he was engaged in bridge construction along various parts of the system, and in 1907 he was appointed engineer of bridges, which position he was holding at the time his present appointment became effective, October 1, 1916. He will have his headquarters at St. Paul, Minn.



H. E. STEVENS.

W. L. DARLING, chief engineer of the Northern Pacific, with office at St. Paul, Minn., whose resignation has just been accepted, was born March 26, 1856, at Oxford, Mass., where he received his early education. His technical education was obtained at Worcester Polytechnic Institute, and, upon graduating, he entered the engineering department of the Northern Pacific. From June, 1879, to August, 1883, he was resident engineer and later locating engineer on that road. From August, 1883, to February, 1884, he was resident engineer on the St. Paul & Northern Pacific, and from April to July, 1884, he was locating engineer on the Chicago, Burlington & Quincy, going to the Florida Railway in December, 1884, as locating engineer. In August, 1885, he was appointed engineer in charge of terminals on the Chicago, Burlington & Northern, which position he held until May, 1887, and from May to December of this same year he was chief engineer of the Duluth, Watertown & Pacific. From December, 1887, to January, 1889, he was assistant engineer of the St. Paul, Minneapolis & Manitoba, and from January, 1889, to March, 1891, he was assistant engineer on the Northern Pacific, being promoted to principal assistant engineer, a position he held until July, 1898, when he was appointed assistant chief engineer. He became chief engineer in 1901, but resigned in August, 1902, to become chief engineer of the Chicago, Rock Island & Pacific, with office at Chicago, Ill., a position he held until October, 1905, when he was appointed chief engineer of the Pacific Railway, with office at Seattle, Wash. He resigned in January, 1906, to become chief engineer of the Northern Pacific. During the years 1906 to 1909, inclusive, he was, in addition to his duties as chief engineer of this latter road, also consulting engineer in active charge of construction of the Spokane, Portland & Seattle. In May of this present year he sent in his resignation, to take effect October 1, 1916. He retires to engage in private engineering practice.

W. L. DARLING.

CARL H. NIEMEYER, division engineer of the Pittsburgh division of the Pennsylvania Railroad, was appointed assistant engineer maintenance of way in charge of track work on September 28, succeeding A. B. Clark, promoted to the position of superintendent of the Renovo division. He was born in Williamsport, Pa., in 1869, attended the public schools of that city and graduated from Cornell University in 1891. After a few months as levelman on an engineering corps, laying out logging roads in central Pennsylvania, he entered the service of the Pennsylvania Railroad as a draftsman in the office of the division engineer of the Eastern and Susquehanna division of the P. & E. and the Northern Central in January, 1892. He was appointed assistant supervisor at Millersburg, Pa., on April 1, 1894, being transfered later to St. Marys, Lewistown and Harrisburg. On January 1, 1900, he was promoted to supervisor of the Trenton cut-off of the Philadelphia division, serving in the same capacity later at Harrisburg and Pitcairn. Mr. Niemeyer was promoted to division engineer of the Sunbury division in September, 1905, being transferred to the Conemaugh division in April, 1907, and to the Pittsburgh division in March, 1911, where he remained until his promotion referred to above.

C. H. NIEMEYER.

JOHN D. ELDER, assistant engineer of the Michigan Central, has been appointed division engineer, with headquarters at Niles, Mich., succeeding C. C. Hill, transferred to the valuation department, effective October 1. He was born at Elder Ridge, Pa., in September, 1880, where he received his early education. In 1900 he entered Pennsylvania State College, completing a four years' course. In June, 1908, he took employment with the Detroit River Terminal Company, a subsidiary of the Michigan Central, organized for the construction of a tunnel under the Detroit river and the building of yards in connection therewith, being made an inspector on third-rail and interlocking construction. From March, 1911, to March, 1913, he was connected with the engineering department of the Kansas City Terminal, and from March, 1913, to March, 1915, he was assistant construction engineer with the Detroit River Terminal Company, working on the extension of the yards in connection with the new Michigan Central passenger station. While engaged on this undertaking he was practically in charge of the electrification and interlocking work. From March, 1915, to October, 1916, he was associated with the valuation department as assistant engineer in charge of costs.

JOHN D. ELDER.

TRACK

M. DODD has been appointed assistant roadmaster on the Bay City division of the Michigan Central, with office at Vassar, Mich. Herman Wichert has been appointed assistant roadmas-

ter of the Detroit Terminal division, with headquarters at Detroit, Mich.

HARRY C. RUPPLE has been appointed roadmaster of the First district of the Pasco division of the Northern Pacific, with office at Pasco, Wash.

HARRY C. RUPPLE, roadmaster on the Third district of the Pasco division of the Northern Pacific, has been transferred to the First district, with headquarters at Pasco, Wash.

F. H. CARPENTER has been appointed roadmaster of the Atchison, Topeka & Santa Fe, with headquarters at Hutchinson, Kan., succeeding J. R. McGovern, who relieved V. H. Shore as roadmaster at Dodge City, Kan.

G. G. AUSTIN, formerly with the Union Pacific, has been appointed roadmaster of the Chicago Junction Railway at Chicago, Ill., succeeding Michael Murphy, granted an extended leave of absence on account of continued ill health.

JOHN BRET, extra gang foreman on the Kansas division of the Union Pacific, has been appointed roadmaster at Manhattan, Kan., in charge of track from Manhattan, Kan., to Beatrice, Neb., and from Junction City, Kan., to Belleville, succeeding J. P. Hopkins, transferred to Kansas City, Mo., with jurisdiction over the Kansas City Terminals and the line west to Topeka, in place of W. M. Kilgore, granted a leave of absence because of sickness.

J. C. POFFENBERGER, recently advanced to the position of assistant supervisor on the Pennsylvania Railroad, at Phillipsburg, N. J., was born at Harrisburg, Pa., in 1888. He graduated from the course in civil engineering at Lehigh University in 1911, and entered the services of the railway company shortly afterward as a rodman. In March, 1916, he was advanced to transitman, and in September of the same year he was promoted to assistant supervisor at Phillipsburg, N. J.

M. SLATTERY, roadmaster on the south end of the Mackinaw division of the Michigan Central at Bay City, Mich., has been transferred to the Saginaw division, with headquarters at West Bay City, succeeding Dennis C. Shea, deceased. E. Sargeant, roadmaster on the northern end of the Mackinaw division, with headquarters at Cheboygan, Mich., has been transferred to Bay City, succeeding Mr. Slattery. J. E. Crowley, assistant roadmaster at Cheboygan, has been promoted to the position of roadmaster, with headquarters at the same point. E. Gibbon, section foreman, succeeds Mr. Crowley as assistant roadmaster at Cheboygan.

J. D. ARCHIBALD, who was recently appointed supervisor on the Pennsylvania Railroad at Barnesboro, Pa., was born April 30, 1883. He graduated from the N. E. Manual Training School and entered the services of the Pennsylvania as a rodman on the New York division on October 11, 1902. On January 1, 1906, he was promoted to draftsman on the same division, a position he held for three years, when he was promoted to transitman in the office of the engineer maintenance of way. He became assistant supervisor at Baltimore in March, 1910, and was transferred to Lamokin, Pa., on June 16, 1913, where he remained until his recent advancement to the grade of supervisor.

LAWRENCE H. BELL, whose promotion to roadmaster of the Pere Marquette, with office at Saginaw, Mich., was recently announced, was born February 8, 1888, at Belmont, Ohio. After receiving a preliminary education in his home community, he took a technical course at the Ohio State University, from which he graduated in 1905. He entered railway employment in June, 1912, with the Erie as a rodman, being promoted later to transit man on construction work. He remained in the engineering department of this road until April, 1913, when he resigned to take the position as assistant engineer on the Pere Marquette. His present appointment to roadmaster became effective September 1, 1916.

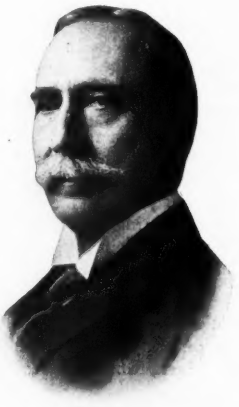
F. W. L. SCHNEIDER, supervisor of the Pennsylvania Railroad at Tyrone, Pa., was transferred to the same position at Lancaster, Pa.; S. L. Church, supervisor at Dravosburg, Pa., was transferred to Tyrone; H. A. Gass, supervisor at Wilkes-Barre, was transferred to Dravosburg; F. D. Davis, supervisor at Barnesboro, Pa., was transferred to Wilkes-Barre; J. D. Archibald, assistant supervisor at Lamokin, Pa., was promoted to the position of supervisor, with headquarters at Barnesboro; R. L. Kell, assistant supervisor at Altoona, Pa., was transferred to Lamokin; H. H. Kauffman, assistant supervisor at York, Pa., was transferred to Altoona; R. P. Graham, assistant supervisor at Freeport, Pa., was transferred to York; E. B. Gallow, assistant supervisor at Phillipsburg, N. J., was transferred to Freeport; J. G. Poffenberger, transitman in the office of engineer maintenance of way, was promoted to the position of assistant supervisor, with headquarters at Phillipsburg, N. J. These appointments were effective September 28.

BRIDGE

R. W. SMITH has been appointed general foreman of bridges and buildings of the Trinity & Brazos Valley, with headquarters at Teague, Tex., succeeding B. M. Hudson, promoted.

OBITUARY

VIRGIL GAY BOGUE, consulting civil engineer, New York, died on October 14 on a steamship on which he was returning from Mexico. He was born at Norfolk, N. Y., on July 20, 1846, and graduated from Rensselaer Polytechnic Institute in 1868. One year after graduation he went to Peru, where he was engaged in railway construction and operation for several years. Returning to the United States on the outbreak of hostilities between Peru and Chile, he was engaged in the location and construction of the western extension of the Northern Pacific across Idaho and Washington. From November, 1886 until 1891, he was chief engineer of the Union Pacific, resigning on the latter date to engage in consulting engineering in New York. He was a member of the commission appointed by President Harrison to investigate methods of improving the navigation of the Columbia river and afterwards was consulting engineer for the Governor of New Zealand for three years in the selection of a route for a proposed railway across the South Island. He later served as consulting engineer of the Western Maryland. He was vice-president and chief engineer of the Western Pacific during the period of its construction, from 1905 to 1909.



VIRGIL G. BOGUE.

DENNIS C. SHEA, roadmaster of the Saginaw division of the Michigan Central, died in Bay City, Mich., on August 24. He was born on November 14, 1855, and entered the service of the Michigan Central as a laborer in April, 1870. He was appointed section foreman at Leslie, Mich., in October, 1878, and served in this capacity at different points until June, 1892, when he was promoted to assistant roadmaster. He was again promoted to the position of roadmaster September, 1898, which position he occupied until his death. His entire service was with the Michigan Central.

TIE CUTTING.—An interesting method of producing railroad ties is now being tried by James Bradley of Evansville, Ind., who has recently received a contract to produce 150,000 ties from the Hobart-Lee Tie Company of Springfield, Mo. About 1,500 acres of land near Ozark, Mo., was purchased, and as experienced tie makers were scarce small portable gasoline saw mills have been installed at which ties are being produced at the rate of 1,500 per day.

HOW ONE ROAD DOES IT.—In the maintenance of way department, this plan has been adopted. Every morning when the section foreman takes out his Italians, Greeks, Austrians or other foreigners, who compose most of our section gangs, he tells them to be careful, to look out for trains and for the avoidance of all manner of injuries, such as getting their fingers pinched or dropping rails or ties on their feet. Periodically the division engineer meets the section foremen and gives them a talk on safety, especially in regard to the proper loading and unloading and handling tools, jacks, rails, ties and other materials, looking out for teams and the proper practice on their approach, and all other questions.—The Maize.

CONSTRUCTION NEWS

THE BALTIMORE & OHIO has given a contract to J. J. Walsh & Sons, Baltimore, Md., for the construction of new freight facilities at Parkersburg, W. Va., at a cost of $300,000.

THE CANADIAN NORTHERN is erecting a warehouse 86 ft. long, 48 ft. wide and two stories high at Edmonton, Alta., Canada. It will have concrete foundations and brick walls, and is estimated to cost $90,000.

THE CHESAPEAKE & OHIO has let a contract to Ballard, Herring & Severs, Inc., Yancy Mills, Va., for the construction of a line from Man, W. Va., south along Guyan river, to Gilbert, 13 miles. The line has no adverse grade against loaded traffic and a 0.5 per cent grade against empty traffic. The maximum curvature is 12 deg. The construction involves about 36,000 cu. yd. of material per mile, with one-deck girder bridge.

THE CHICAGO, BURLINGTON & QUINCY plans to build two large freight terminal buildings at Chicago, Ill., to replace structure to be removed to make way for the new Union station. The freight houses will be three stories high, 65 ft. wide and 800 ft. long. The materials to be used will be brick, steel and reinforced concrete. It is expected that bids will be asked about December 1.

THE CHICAGO, WEST PULLMAN & SOUTHERN is erecting a combination engine house and machine shop at Chicago, Ill. The building will have concrete foundations and brick walls; it will be one story high, 125 ft. long and 175 ft. wide and is estimated to cost about $40,000.

THE LOS ANGELES & SALT LAKE will build a new line from Pico, Cal., through Whittier, Fullerton and Anaheim to Santa Anna, a distance of about 25 miles. The contract for the grading work will soon be awarded. Four combination freight and passenger stations will be built. Both steam and gasoline-electric motive power will be used on the new line.

THE MARENGO, LAKE GENEVA & NORTHERN has awarded a contract to the Cortlandt Engineering Company, New York, to complete its line from Marengo, Wis., to Delavan.

THE MISSOURI PACIFIC will undertake a grade separation project at Omaha, Neb., involving the elimination of grade crossings at Dodge, Douglas and Farnam streets. The work will involve the construction of three concrete-covered steel viaducts to carry the streets over the tracks and will also include about 300,000 cu. yd. of embankment in the approaches. The work will be done by company forces and is estimated to cost $200,000.

THE MITCHELL & NORTHWESTERN has been granted a permit by the railroad commission of South Dakota to build a line from Mitchell, S. D., northwest about 100 miles to Highmore.

THE NEW YORK CENTRAL has let a contract to Manion Brothers for a new freight house at Lockport, N. Y., to be located about one mile west of the existing station in that city. The new building will be 40 ft. wide and 400 ft. long, with an office building 2 stories high at the east end for a length of 60 ft. The building will be of ordinary construction with concrete foundation.

THE NORFOLK SOUTHERN has opened bids for the construction of a combined passenger and freight station at Asheboro, N. C. The structure will be 30 ft. wide and 125 ft. long, with concrete foundations, brick walls and a metal or asbestos shingle roof.

THE NORTHERN PACIFIC will call for bids about November 1 for a line between Laurel, Mont., and the Lake Basin district, a distance of about 35 miles.

THE OREGON-WASHINGTON RAILROAD & NAVIGATION COMPANY has awarded a contract to Muir & McClelland, Portland, Ore., for the construction of new additions to the Albuia shops in Portland at an estimated cost of about $25,000.

This road has also awarded contract to Twohy Bros., Portland, Ore., for the construction of an extension 10 miles long from the mouth of Beaver Creek to the head of Carbon Creek. Camps have been erected and active work was commenced, October 1. About 125,000 cu. yd. of grading will be necessary, as well as some clearing and grubbing. A number of small bridges and culverts will e constructed. The approximate cost of this work will be close to $200,000.

THE PENNSYLVANIA LINES WEST are rebuilding with company forces two miles of the Wellsburg & State Line Railroad, which includes some grading, new ties and 307 lin. ft. of bridge superstructure.

This road has also awarded a contract to Ferguson & Edmundson, Pittsburgh, Pa., to build part of a new 12-mile line from Chester, W. Va., along the south bank of the Ohio river east to the mouth of Raccoon creek, about three miles below Beaver, Pa.

THE PENNSYLVANIA RAILROAD will enlarge its yard at Morrisville, Pa., at a cost of about $650,000.

THE PHILADELPHIA, BALTIMORE & WASHINGTON is constructing second track on the Delaware division, from Greenwood, Del., to Harrington, 7.44 miles; Greenwood to Bridgeville, 6.05 miles, and Seaford to Broad Creek, 3.34 miles.

THE PHILADELPHIA & READING has awarded contracts for a bridge to be built over Pennypack creek at Bryn Athyn, Pa. The J. E. Brenneman Company has the contract for the substructure, the McClintic-Marshall Company for the superstructure and the Benjamin Foster Company for the waterproofing of the bridge. The bridge is to be a two-span, single-track, through-plate girder bridge, each span being 54 ft. 3 in. clear. It is being built for the Philadelphia, Newtown & New York Railroad to replace a through wooden truss which was destroyed by fire.

THE SOUTHERN is enlarging its facilities for repairing cars at Spencer, N. C. The improvements consist of a new all-steel car shed, 109 ft. by 600 ft., with a shop 50 ft. by 100 ft., the shed being equipped with overhead cranes for handling car bodies and materials. Additional track room will also be provided.

This road has let contracts for the construction of a new concrete and steel bridge across the Catawba river, near Belmont, N. C., to take the place of the temporary structure, erected after the destruction of the old bridge by a flood in July. The contract for the steel work has been awarded to the Virginia Bridge & Iron Company, Roanoke, Va., and for the masonry and approaches to Robert Russell. The new bridge will be located about 40 ft. north of the site of the old bridge, and the track will be 11 ft. higher than on the old bridge. It will be 900 ft. long and will consist of nine 100-ft. deck plate girders, supported on concrete piers.

This road has also awarded a contract to James L. Marshall, Washington, D. C., for the construction of a new office building, 120 ft. by 90 ft. in area and 9 stories high, at an estimated cost of $400,000. The building is expected to be completed by April 1, 1917.

THE ST. LOUIS SOUTHWESTERN is building a 15-stall roundhouse at Pine Bluff, Ark., with company forces, the approximate cost of which is $30,000.

THE WESTERN MARYLAND has given a contract to the Price Concrete Construction Company, Baltimore, Md., for the construction of an office building on Pt. Covington street, Baltimore. The building will be 40 ft. wide, 76 ft. long and 2 stories in height and will cost about $12,500.

STRUCTURAL STEEL

THE BALTIMORE & OHIO has ordered 700 tons of bridge steel from the Fort Pitt Bridge Works, 100 tons from the Toledo-Massillon Bridge Company and 550 tons from other shops.

THE CHICAGO & NORTHWESTERN has ordered 1,076 tons of steel for ore spouts for No. 3 dock at Ashland, Wis., from the American Bridge Company.

THE GREAT NORTHERN is in the market for 3 65,000-gal. steel tanks with 30-ft. steel towers, 1 28,500-gal. steel tank with a 13-ft. steel tower and 2 10,000-gal. steel tanks.

THE MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE has ordered 478 tons of steel from the American Bridge Company for use in an extension to ore docks at Superior, Wis.

THE OGDEN, LOGAN & IDAHO has ordered 146 tons of steel for pony through trusses for bridges at Ogden, Utah, from the Ogden-Salt Lake Company.

THE VANDALIA has ordered 778 tons of steel for three riveted truss spans and one plate girder span for the Indianapolis & Frankfort Railway.

SUPPLY TRADE NEWS

PERSONAL

STANLEY H. SMITH of the sales department of the Bethlehem Steel Company, Chicago, Ill., has been appointed sales agent of the Cleveland district, with office at Cleveland, Ohio.

G. A. WHITE, metallurgist of the American Sheet & Tin Plate Company, has been appointed to the same position with the Titanium Alloy Manufacturing Company, Niagara Falls, N. Y.

HARRY A. PIKE, secretary of the Clifton Porcelain Tile Company, Inc., Newark, N. J., has also been made assistant to the president of the Call Switch Company, Inc., New York, and the executive offices which have been located at Denver, Colo., have been transferred to the Singer building, New York.

ROBERT C. CLIFFORD, who for the past four years has been district sales manager for the United States Cast Iron Pipe & Foundry Company, in charge of its St. Louis and Kansas City offices, is now associated with the Walter A. Zelnicker Supply Company, St. Louis, in charge of its rail department.

GEORGE A. KYLE has been engaged as engineer in charge of location and construction of the railways to be built in China by the American International Corporation, New York City, and the Siems-Carey Railway and Canal Company, St. Paul, Minn. He will work with officials of the Chinese government in deciding upon the lines to be built. Mr. Kyle has worked in both hemispheres, north and south of the equator, and was associated with John Hays Hammond in the Rand in South Africa. In Alaska he built over 600 miles of line, including the line from Seward to the Matanuska coal fields and a line to Fairbanks. Recently he has been engineer in charge of location and construction for the Northern Pacific.

HARRY W. FINNELL, general manager of the Henry Giessel Company, Chicago, has been elected vice-president in charge of sales of Templeton, Kenly & Company, Ltd., Chicago, manufacturers of Simplex jacks. Mr. Finnell started his business career in the rolling mills of the National Tube Company, at McKeesport, Pa., in 1889. Later he became connected with the sales department of this firm, but left the company in 1901 to become connected with the Wheeling Steel & Iron Company, rising to the position of assistant sales manager. In 1906 he entered the sales department of the Chicago Railway Equipment Company. In 1909 he was appointed assistant sales manager of the Carbon Steel Company, later being made sales manager and then assistant to the president, and at the same time president of the Mosher Water Tube Boiler Company. He was general manager of the Henry Giessel Company at the time of his appointment noted above.

HARRY W. FINNELL.

WILLIAM F. LEAKE, secretary and treasurer of T. S. Leake & Co., general contractors, and also secretary and treasurer of the Railroad Water & Coal Handling Co., Chicago, Ill., died at his home in this city, October, of pneumonia after a brief illness. He was born in June, 1858, at Ottawa, Ill., where he received his early education. In his boyhood he took up the carpenter's trade, obtaining his first employment with the Sanders Bros. Mfg. Co. of that city. After a few years he entered the service of the Illinois Central, later being made general foreman of carpenters for the entire system. After several years with this company he became general superintendent of George B. Swift & Co., general contractors. In 1907 he and his brother, T. S. Leake, organized the contracting firm of T. S. Leake & Co., of which he became secretary and treasurer. In 1914 he also became interested in the Railroad Water & Coal Handling Co., Chicago, Ill.

MARVIN A. NEELAND, assistant to the vice-president and chief engineer of the United States Steel Corporation, has resigned to accept the position of consulting engineer of the American International Corporation, New York. He is succeeded by John Hulst, chief engineer of the Carnegie Steel Company.

W. P. BARBA, vice-president of the Midvale Steel Company, Worth Brothers Company and the Wilmington Steel Company, has resigned and his duties will be assumed by E. E. Slick, vice-president of the Cambria Steel Company. Mr. Barba entered the employ of the Midvale Company as a boy in 1880 and advanced through the positions of chief chemist, departmental superintendent, general manager of sales, general superintendent and general manager to that of vice-president.

GENERAL

THE H. W. JOHNS-MANVILLE COMPANY, New York, has opened a new branch office at Great Falls, Mont., in charge of J. H. Roe. This company now has 55 branch offices.

R. W. HUNT & Co., Chicago, has been awarded the contract for the inspection of all the rails and fastenings, aggregating over 400.000 tons, which have been ordered recently from the steel mills of this country by the Russian government railways.

THE CARNEGIE STEEL COMPANY and other large steel companies in the Pittsburgh district have notified their customers that steel orders from the United States government will be given precedence over other orders for steel early in 1917, providing the government needs the steel to carry out its naval program as an aid to preparedness, especially in the delivery of steel plates and shapes for new naval vessels.

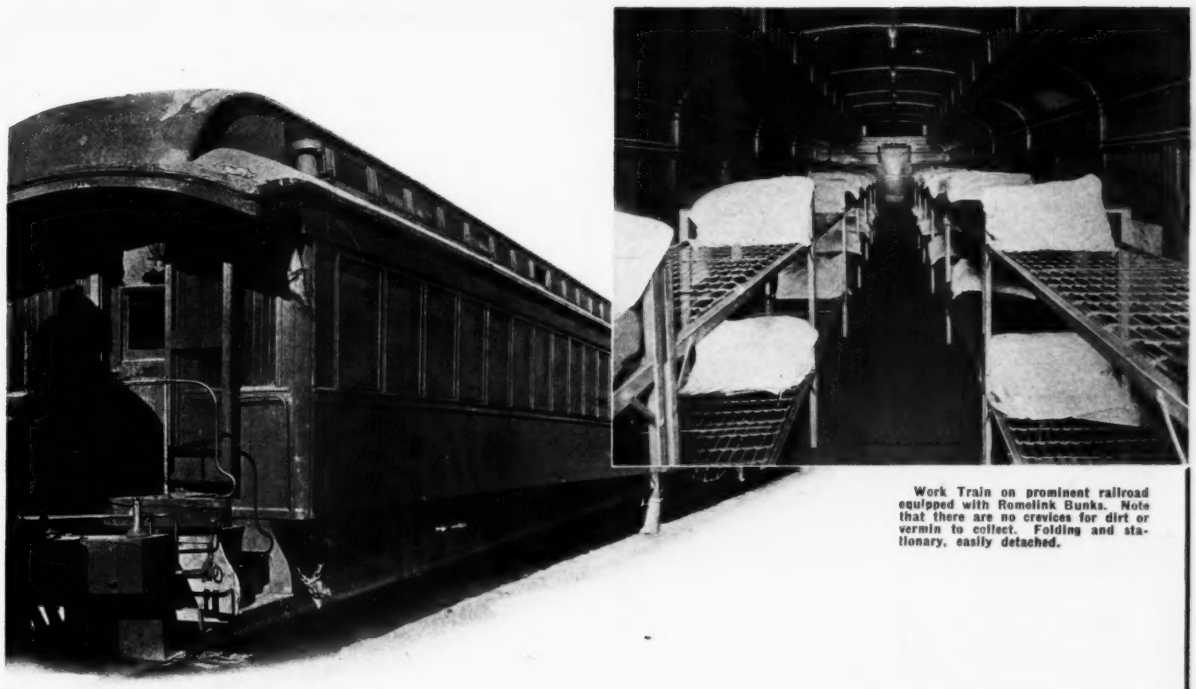
ACCORDING to E. J. Buffington and G. G. Thorpe, presidents, respectively, of the Illinois Steel Company and the Indiana Steel Company, five additional blast furnaces are to be erected at the Gary, Ind., plant. This will make 17 stacks in all, the largest single group in America. New construction now under way at the plant will cost between $15,000,000 and $20,000,000, and employment will be given to several thousand men on its completion next year. The National Tube Company plans call for four blast furnaces, several ore docks, a Bessemer mill and auxiliary facilities. Plans are also under way for the American Locomotive Company's new plant, and for that of the American Car & Foundry Company, both of which are to be located at Gary.

TRADE PUBLICATIONS

SIMPLEX JACKS.—Templeton, Kenly & Co., Ltd., Chicago, has issued a 32-page pamphlet illustrating and describing the various types of jacks now on the market under the above name. Maintenance men will be interested in the several designs of track jacks, bridge jacks and jacks especially designed for handling telegraph or telephone poles.

WATER TREATMENT. The Dearborn Chemical Company, Chicago, has issued a booklet, entitled "Incrustation, Corrosion, Foaming and Other Effects of Water Used in Steam Making and Methods of Prevention." After pointing out that this company does not supply a "cure-all" and that it is not a "boiler compound house," the book discusses the subjects of corrosion, foaming and other boiler troubles and then describes how this company makes analyses, works out formulae and compounds the proper remedies for individual conditions.

ASBESTOS BUILDING MATERIALS.—The H. W. Johns-Manville Company, New York, has issued two 32-page pamphlets covering transite asbestos shingles and corrugated asbestos roofing, respectively. The pamphlets are illustrated with views of buildings of all kinds in various parts of this country in which these materials have been used. Several pages are also devoted to data of size, shape, weight, etc., to facilitate estimating. The pamphlet on corrugated roofing is especially complete as to this feature and contains a number of sketches of construction details for the use of this material on steel frame shop buildings.



Work Train on prominent railroad equipped with Romelink Bunks. Note that there are no crevices for dirt or vermin to collect. Folding and stationary, easily detached.

Give Your Workmen a Good Night's Rest

"A contented mind is a continual feast"—True, but a rested workman after a good night's sleep is not only contented, but a better and more efficient workman. In short, contented workmen are a big asset to any railroad or contractor.

Romelink All-Metal Bunks
For Work Trains

The labor problem for 1916-17 is going to be the big worry. To hold men, to keep them contented, and to have them efficient, depends largely on how they live from day to day in your work trains. Good, comfortable beds are absolutely essential if you are to keep your workmen contented and comfortable.

Equip your work trains with Romelink Bunks; they are economical and cost much less in the long run than old-style wooden bunks. Besides, they are absolutely sanitary—no crevices for vermin to gather; they can be easily and quickly cleaned—besides, they are fireproof. As to their construction, note these points—all castings are malleable (not chilled) iron—all springs are galvanized to prevent rusting—while frame is hand-riveted, hence no bolts to loosen. Above all else, the springs are absolutely sagless. This is due to the weave of the spring. Dampness or use will not make them sag.

Compare the cost of wooden bunks with that of Romelink Double Deck Bunks, then you will see at once why Eastern Roads are ordering Romelink Bunks for their work trains. The U. S. Government used about 20 000 Romelink Bunks at the Panama Canal. The Baltimore Dry Docks and Ship Building Company use a large number. Fill out the coupon for all the facts and figures.

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SOUTHERN-ROME COMPANY.
633 West Pratt Street.
Baltimore, Md.

Gentlemen:
Without obligating myself in any way, kindly send me complete details, blue-prints and illustrations of Romelink Bunks.

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Address.....

Railroad.....

Position.....

Southern-Rome Company

617-633 West Pratt Street **Baltimore, Md.**

3 Minute Test

WRITE for the free testing outfit of Reeves Wood Preserver. You can then make a simple and practical demonstration which will prove in three minutes that Reeves Wood Preserver actually penetrates wood just as water penetrates a sponge.

Reeves Wood Preserver

is 80 per cent heavy Oil of Tar (Creosote). It has all the preserving value of any other oil, but it has the added value of penetrating without the aid of heat or apparatus.
It's "The Easy Way to Prevent Decay."
Reeves Wood Preserver is treating plant and preservative in one. The test on your desk will prove this beyond any question of doubt. Write for the free testing outfit.

The Reeves Co.
New Orleans, La.

Test Box Free

STATEMENT of the ownership, management, etc., required by the Act of Congress of August 24, 1912, of the *Railway Maintenance Engineer*, published monthly at Chicago, Ill., for October 1, 1916.

State of New York } ss.
County of New York }

Before me, a notary public in and for the State and County aforesaid, personally appeared Edward A. Simmons, who having been duly sworn according to law, deposes and says that he is the President of the *Railway Maintenance Engineer*, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in Section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher, Simmons-Boardman Publishing Co., Woolworth Building, New York, N. Y.
Editor, Elmer T. Howson, Transportation Building, Chicago, Ill.
Managing Editor, none.
Business Managers, none.

2. That the owners are:
Owner — Simmons-Boardman Publishing Co., Woolworth Building, New York, N. Y. Stockholders holding 1 per cent or more of total amount of stock: Edward A. Simmons, Woolworth Building, New York; Lucius B. Sherman, Transportation Building, Chicago, Ill.; Henry Lee, Woolworth Building, New York; Henry Lee, Woolworth Building, New York (Trustee for Thos. Prosser); Samuel O. Dunn, Transportation Building, Chicago, Ill.; Roy V. Wright, Woolworth Building, New York; Elmer T. Howson, Transportation Building, Chicago, Ill.; H. H. Simmons, Transportation Building, Chicago, Ill.; Ida R. Simmons, 1625 Ditmas Ave., Brooklyn, N. Y.; Bradford Boardman, 203 W. 40th St., New York; Francis Boardman, Riverdale, N. Y.; A. C. Boardman, Riverdale, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: Clara T. Boardman, 56 W. 58th St., New York, N. Y., and Henrietta F. H. Boardman, 56 W. 58th St., New York, N. Y.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also in cases where the stockholder or security holder appears upon the books of the company as Trustee or in any other fiduciary relation, the name of the person or corporation for whom such Trustee is acting is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as Trustees hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

EDWARD A. SIMMONS.

[SEAL] Sworn to and subscribed before me this 6th day of October, 1916.

G. H. RAYMOND.

Notary Public, Kings County, No. 50; Certificate filed New York County No. 102; New York Register No. 8113; Commission expires March 30, 1918.

A Simple Test to Determine the Purity of Creosote Oils

The spot or discoloration test for the preliminary examination of creosote oil to determine its purity is simple and infallible, as proved by determinations made at the United States Forest Products Laboratory, Madison, Wis.

THE SPOT TEST

Let a few drops of the sample of creosote oil fall on the surface of clean, white blotting paper. If tar, free carbon or dirt is present it will be readily observed, as it quickly segregates to the center. The paper should be laid away for a few hours in a flat position in a place free from dust. If then examined, any tar, free carbon or other extraneous matter present in the oil will be observed in a distinct zone in the center, the outer zone indicating the character of the oil.

Diesel Engine Users Adopt the Spot Test

The Diesel Engine Users' Association of England have adopted the spot test for the examination of the oils used for fuel in this type of engine. The spot test never fails to do its work.

Reilly Improved Creosote Oil

Welcomes the Spot Test

Reilly Improved Creosote Oil not only welcomes, but invites the spot or any other test, chemical or physical, to determine its purity. It has nothing to fear. It is pure creosote oil. Its use is positive insurance against rot or decay in railroad cross-ties, bridge timbers, poles, cross-arms, piling or interior wood block floors. No tar, free carbon or other extraneous matter will be found in it. By adding Reilly Improved Creosote Oil to No. 1 Maintenance of Way Oil the efficiency of the latter will be increased in proportion to the amount of Reilly Improved Creosote Oil added. It stays in the wood. There is no evaporation or leaching. It lubricates the ties, lessening the friction of rail plate or rail on the tie.

We are prepared to execute orders, large or small, for creosoted wood for every purpose, or to supply the trade with Reilly Improved Creosote Oil in any quantity from a barrel to a train load.

REPUBLIC CREOSOTING COMPANY

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Plants: Indianapolis Mobile Minneapolis Seattle

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ahead, Railway men, when you protect your metal work with

DIXON'S
SILICA GRAPHITE
PAINT

It has a world-wide reputation of over fifty years. Made in FIRST QUALITY only. Made for those who want QUALITY, LONGER SERVICE and LOWEST COST per year of service.

Because of the peculiar oily nature and flake formation of the pigment, Dixon's Paint has no equal in keeping moisture and gases away from the metal. Therefore metal properly painted with it resists corrosion longer than that painted with any other paint. That is the reason why leading railroads throughout the entire world use it as standard.

Write for booklet No. 187B and long service records.

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B-134

"IMPERIAL"
PNEUMATIC
TIE TAMPERS

Will do as much work in a day as eight men tamping by hand.

An "Imperial" Tamping unit added to the equipment of your construction gang will speed up the work proportionately.

"Imperial" tamped track is more evenly tamped and permanently stable than the best hand tamping.

"Imperial" Tampers operate from a portable Compressor Car or from switch or signal air lines. They handle any kind of ballast with equal effectiveness. They are simple and easy to operate—skilled labor is not essential. It is probable that you would save many times the cost of the equipment on a single season's work.

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"IMPERIAL" TAMPING OUTFITS

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Ask for a Copy

Ingersoll-Rand Company
11 Broadway New York
Offices the World Over

33TT

"Z" Iron Tie Checkers

have been adopted by many of the leading railroads who are awake to the importance of Tie Conservation.

The "Z" iron is greatly superior to the old "S" style, but we furnish these also if you prefer them.

Samples and prices on request.

Brazil Stamping & Mfg. Co.
BRAZIL, IND.

The Letters and The Gutters

PERE MARQUETTE RAILROAD CO.
Saginaw, Mich., April 25th, 1916.

E. M. Long & Sons.
Cadiz, Ohio.

Gentlemen:
We purchased a quantity of your O. G. Fir Gutters in January, 1911, for shop buildings at Saginaw, and another lot in September, 1911, for new freight house at Saginaw. These gutters are still in good condition.

Yours truly,
J. E. Johnson, Div. Engr.

The Letters

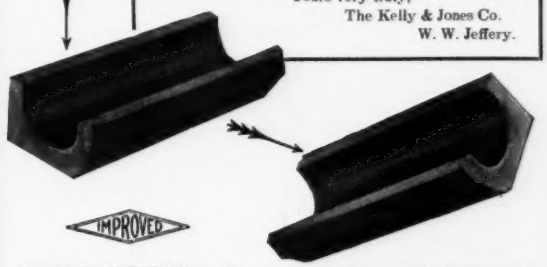
THE KELLY & JONES CO.
Greensburg, Pa., April 19th, 1916.

E. M. Long & Sons,
Cadiz, Ohio.

The 1300 ft. of your O. G. Fir Gutters we purchased in June, 1908, have been in use since that date and have not cost us a dollar for repairs or renewals, and they are still in first-class condition.

Yours very truly,
The Kelly & Jones Co.
W. W. Jeffery.

The Gutters



IMPROVED O. G. FIR GUTTERS
"The Everlasting Kind"

A Quarter Century of service with no Attention. First cost less than copper or tin, last three times as long and eliminate maintenance charges. Secure them all by specifying improved O. G. Fir Gutters.

Booklet "Gutter Facts" on request

E. M. LONG & SONS, Cadiz, Ohio

Point of Contact

Have you ever tried to analyze your product as to its advertising possibilities? Have you ever gone deep down into its sales possibilities to find the "point of contact' between it and its possible buyers?

Often the "point of contact" is hard to find; for it is always the obvious that escapes us.

If a product or device makes for economy, savings, etc., obviously the point of contact is along these lines—but your message should be so placed before the maintenance of way man that your appeal comes within his experience.

Our copy-service department may be able to assist you in establishing the correct point of contact

Call upon us to assist you whenever you feel that your copy-plan needs the viewpoint of the man outside

IF YOU ARE

An executive, an editor, or connected with a Business Paper in any capacity;
an advertiser in a Business Paper;
an advertising agency or service man;
a teacher of advertising,
or an "advertising man"—

YOU ARE INVITED

—to attend the annual convention of the ASSOCIATED BUSINESS PAPERS, which will be held at—

THE HOTEL ASTOR, NEW YORK

October 26, 27 and 28, 1916

(Better mark these dates on your calendar now)

We use the word "convention" because we must, but in this instance, it is far from having the conventional meaning. This gathering of the men who control and use the great highways of business news and thought will mark the opening of a new epoch, not alone in the progress of business journalism, but in advertising itself. (And this is not a mere figure of speech.)

For publishers, there will be open forum sessions for the free discussion of problems relating to every phase of the making of good business newspapers.

For advertisers, there will be an exhibit of successful advertising campaigns, including the plan, the copy, the supplementary work, the results. Ideas that have produced thousands of dollars, that have cut the cost of selling, will be shown in complete detail.

Advertising agents and service men, will hear real experts tell how to produce resultful business paper copy, and will get many valuable ideas on the practical use of the trade and technical press.

The far-seeing, progressive agency man will also be not a little interested in the helpful spirit of co-operation that is being developed between his type of agency and the business press. To such, this will be an unusual opportunity.

For all, there will be an upward urge, new inspirations, a freshened enthusiasm, and three days in the world's metropolis at the most delightful season of all the year.

Better make up your mind to come.

The Associated Business Papers

(Succeeding the Federation of Trade Press Associations)

A. A. GRAY, President
608 So. Dearborn Street
Chicago, Ill.

JESSE H. NEAL, Executive Secy.,
231 W. 39th Street, New York City
(Temporary Address)

International Steel Crossing Foundations

under new crossings will more than double their life and greatly decrease maintenance costs; under old, worn and loose built up crossings will greatly extend their life and quickly save the foundation's cost in maintenance charges.

C. C. C. & St. L. R. R. over W. & L. E. R. R. at Wellington, Ohio.

The above illustrated two intersection built up crossing was badly worn and could be kept in service only by constant attention at the time our steel foundation was placed under it early this year.

It is now so well supported that heavy high speed steam traffic on both roads passes smoothly, quietly and with perfect safety, the crossings themselves are wearing into better surface than they have been since they were new and there has been no maintenance cost.

These foundation sections are closed steel box girders with six-inch channel sides and five sixteenths-inch plates top and bottom, with the box filled with tightly fitted creosoted wooden blocks placed crosswise.

The severest traffic conditions cannot injure this steel box girder or its wood block filler.

Support your crossings, new or old, on INTERNATIONAL STEEL CROSSING FOUNDATIONS and save money. They are inexpensive and easy to install. Send us blue prints of your crossings and let us submit quotations.

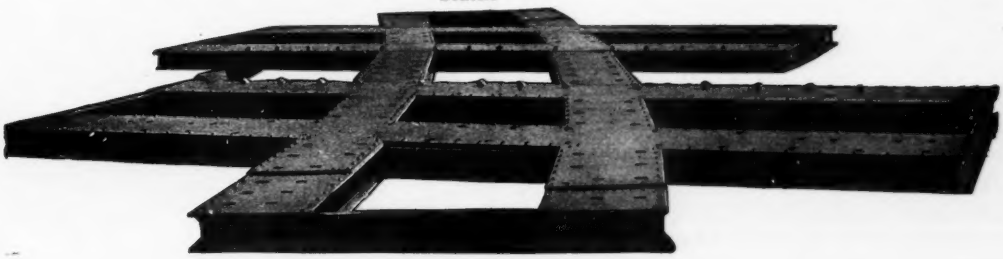
Shipment in Three Weeks

The International Steel Tie Company

General Sales Office and Works, Cleveland, Ohio

REPRESENTATIVES:

Maurice Joy, Philadelphia
William H. Ziegler, Minneapolis
Western Eng'g Sales Co., San Francisco, Los Angeles, Seattle
R. J. Cooper Co., Salt Lake City
J. E. Lewis & Co., Dallas



RAILROAD DITCHING

with its attendant problems of disposal of waste material is being accomplished with maximum economy in all soils and climates by means of

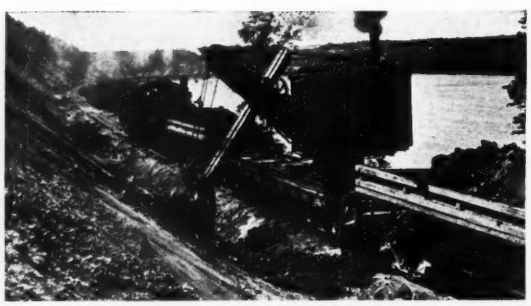
Western Air Dump Cars

The great loads that they carry, the speed at which they may be run, and the fact that they are dumped almost instantaneously, makes the economy of their use over any other equipment almost self-evident.

We will be pleased to send you our handsome new catalogue containing full information.

WESTERN WHEELED SCRAPER CO., Aurora, Illinois

Marion
Railroad Ditchers



Model 15 Marion Ditcher on Canadian Pacific Railway

Three Big Marion Advantages

FIRST: *Independent Boom Engines.* A Marion Ditcher is able to dig through a considerably wider range because of its independent boom (or crowding) engines, thereby saving time of moving back and forth along the bank. It is also able to dig much harder material for the same reason, because of the more positive action of the dipper handle.

SECOND: *Independent Swinging Engines.* A Marion Ditcher is better able to hold its position on curves while digging. The swinging motion is positive in either direction and is not controlled by frictions or similar devices.

THIRD: *A Marion Ditcher may be easily changed into a small revolving steam shovel for work on the ground.* A truck frame for railroad wheels or traction wheels can be substituted for the regular ditcher truck frame, and the ditcher becomes a revolving shovel, suited to a revolving shovel's wide range of work.

These three are only a few of the many points of Marion Ditcher Superiority. Marion Excavating Machinery is being used on hundreds of railroads in the United States and abroad, which is good evidence of its efficiency.

THE MARION STEAM SHOVEL COMPANY
Established 1884 MARION, OHIO
Atlanta Chicago New York San Francisco Seattle
Manufacturers of Excavating Machinery of Every Description

LIDGERWOOD HOISTS

Steam *Electric* *Gasoline*

A complete line of Contractors' Standard Hoists.

Illustration represents improved Bridge Erecting Engine with Six Independent Winch Heads.

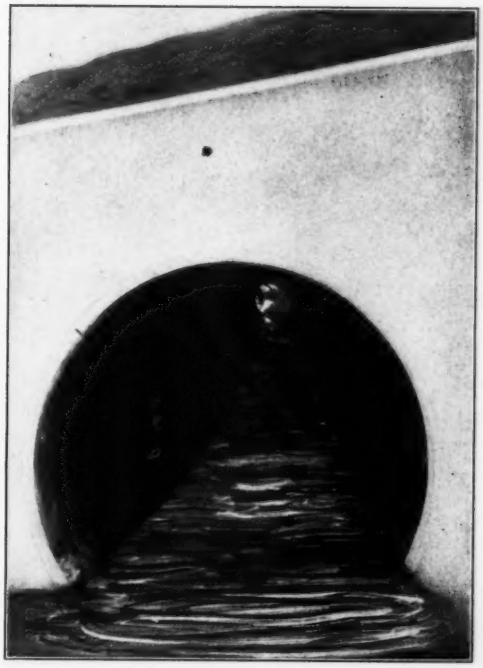
Derricks *Cableways*
Rapid Unloaders
Excavators

Write for Catalogues.

Lidgerwood Mfg. Co.,
96 Liberty St., New York
Philadelphia
Pittsburgh
Chicago Seattle
London, Eng.

Speed
Strength
Capacity

Looking Into NATIONAL Lock Joint Cast Iron Culvert Pipe



Reveals its many advantages, advantages which have caused its extensive use on over forty of the large trunk lines of this country. Advantages which have made National Lock Joint Cast Iron Culvert Pipe Standard on so many of these roads.

These roads have found it paid to specify and insist on this, the pipe made of pure remelted Alabama pig iron, the culvert pipe as permanent as your road bed.

The engineers of these roads know that this pipe made in short length units (3, 4 and 5 ft.) permits easy handling and that the ordinary section gang can install it without accessory of any kind. And further, they know this work can be done without interfering with traffic, there being no piles to drive, no fill to remove, no tunneling to accomplish.

The Pipe of Short Units, Long Service and Low Costs

The pipe that locks effectively, that prevents separation and assures alignment to perfection.

The pipe which solves culvert renewal problems with least expense, greatest efficiency. The pipe that does not rot or disintegrate, the pipe that is mechanically correct and has proved itself the solution to the culvert problem in railway work.

It paid these roads to look into National Lock Joint Cast Iron Culvert Pipe, paid them big in hard cash to specify and insist on it. Remember, just as their requirements and yours are materially the same, those large savings they enjoy are available to you, if you specify and insist on National Lock Joint Cast Iron Pipe.

Catalog and Prices on Request.

AMERICAN CASTING CO.
Birmingham, Ala.
Chicago Office: - Peoples Gas Building
New England Representative
Fred A. Haudlette & Son - Boston, Mass.
St. Louis Representative
H. P. Webb - - Wainwright Building
St. Paul Office
Contractor's Supply and Equipment Co.

The Simmons-Boardman Family is composed of the following members:

(1) Railway Age Gazette,
(weekly)
with 7216 paid subscribers.

(2) Railway Electrical Engineer,
(monthly)
with 1760 paid subscribers.

(3) Railway Maintenance Engineer,
(monthly)
with 5805 paid subscribers.

(4) Railway Mechanical Engineer,
(monthly)
with 7392 paid subscribers.

(5) Railway Signal Engineer,
(monthly)
with 3673 paid subscribers.

EACH paper has a distinct audience, the maximum overlap between the respective subscription lists of all five being less than three per cent.

—If you sell anything that railways buy, but are not familiar with the intricacies of the market, write or telephone us and we will give you full information.

SIMMONS-BOARDMAN PUBLISHING CO.

New York Chicago Cleveland Washington

The Railway Age Gazette, Railway Electrical Engineer, Railway Mechanical Engineer, and Railway Signal Engineer are Members of the Audit Bureau of Circulations. The Railway Maintenance Engineer has applied for Membership in the A. B. C.